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UNDERWATER FACILITIES INSPECTION AND ASSESSMENT AT
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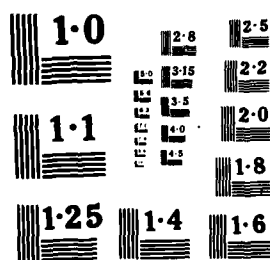
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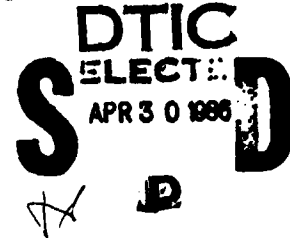
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UNDERWATER FACILITIES
INSPECTION AND ASSESSMENT
AT



NAVAL SUPPLY CENTER
SAN DIEGO,
CALIFORNIA

F P O - I - 83- (43)

Sept., 1983

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Performed for:

Ocean Engineering and Construction Project Office
Chesapeake Division
Naval Facilities Engineering Command
Washington, D.C. 20374

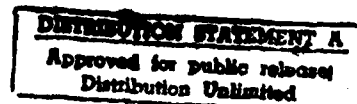
Under:

Contract N62477-81-C-0498
Task 3

By:

J. Agi & Associates Co. Inc.
1414 Alaskan Way, Suite 600,
Seattle, Washington, 98101

Project No: 83-3-2-121



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Underwater inspection, Naval Supply Center San Diego, San Diego, CA

19. ABSTRACT (Continue on reverse if necessary & identify by block number)

Pier 11A at the Naval Supply Center, San Diego was subjected to a detailed underwater inspection with the objective assessing the general structural condition of the in-water structural elements.

A swim-by visual inspection (designated Level I) was conducted on all (Con't)

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BLOCK 19 (Con't)

1847 concrete piles and on the total area of the 1820 lineal feet of concrete seawall and bulkhead. A more detailed inspection and cleaning (designated Level II) was performed at 30 sites distributed among three elevations at 10 stations located at 200 foot intervals laterally along the bulkhead. The Level II inspection also included 11% of the bearing and batter piles. Representative samples of all significant deterioration/damage found were photo-documented.

The analysis of inspection findings indicates that the overall condition of the support structure of Pier 11A is good. The concrete sheet pile bulkhead is in very good condition, no significant damage or other deterioration was found. The majority of the concrete bearing and batter piles were found to be in very good condition, however, one section of the North Apron of the Pier was found to have sustained significant damage. A total of 18 piles in this section were identified as having sustained significant cracking, spalling and/or corrosion of rebar. The estimated cost of repairing these piles is approximately \$24,000.00. This level of damage represents approximately 35% of the 51 examined piles. Projecting this over the entire North Apron section it is estimated that 175 piles may be damaged, and the estimated repair cost would be \$225,000.00. It is recommended that a Level II inspection be planned for all the other piles in the North Apron which were not Level II inspected.

Although no included in the scope of the current contract, observations on the condition of the fender system were also made. This system has sustained significant damage and should receive detailed maintenance inspection and planning.

EXECUTIVE SUMMARY

Pier 11A at the Naval Supply Center, San Diego was subjected to a detailed underwater inspection with the objective of assessing the general structural condition of the in-water structural elements.

A swim-by visual inspection (designated Level I) was conducted on all 1847 concrete piles and on the total area of the 1820 lineal feet of concrete seawall and bulkhead. A more detailed inspection and cleaning (designated Level II) was performed at 30 sites distributed among three elevations at 10 stations located at 200 foot intervals laterally along the bulkhead. The Level II inspection also included 11% of the bearing and batter piles. Representative samples of all significant deterioration/damage found were photo-documented.

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Although not included in the scope of the current contract, observations on the condition of the fender system were also made. This system has sustained significant damage and should receive detailed maintenance inspection and planning. Refer to the accompanying Executive Summary Table for details.

N.S.C. SAN DIEGO
EXECUTIVE SUMMARY TABLE

FACILITY	YEAR BUILT	TOTAL NO. OF PILES/L.F. BULKHEAD	STRUCTURE SIZE	STRUCTURE TYPE	RECOMMENDATIONS	ESTIMATED COST OF RECOMMEND.	ESTIMATED TOTAL COST OF REPAIRS FOR PROJECTED DAMAGE
PIER 11A	1941	1847/1820'	1000' X 250'	20" X 20" concrete piles 18" X 20" concrete sheet piles.	Repair 18 concrete piles	\$ 24,000.00	\$ 225,000. 00

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SECTION 1 - INTRODUCTION

1.1 CONTRACT

Department of the Navy,
Chesapeake Division,
Naval Facilities Engineering Command,
Building 212, Washington Navy Yard,
Washington, D.C. 20374

1.2 CONTRACT NO.

N62477-81-C-0498
Task 3

1.3 CONTRACT DATE

September 30, 1982

1.4 CONTRACT DESCRIPTION

The contractor shall provide all required engineering services necessary for underwater assessment of various Navy waterfront facilities as directed by the officer in charge and as specifically described in individual orders. The third award under this contract is for the assessment of the structural condition of underwater structural members at waterfront facilities, Naval Supply Center, San Diego, California. The following table details the specific scope of work for this project.

FACILITY	TYPE OF INSPECTION			
	LEVEL I No. of Concrete Piles	LEVEL I Lineal feet of Concrete Bulkhead	LEVEL II No. of Concrete Piles	LEVEL II No. of Sites - Concrete Bulkhead
Pier 11A	1847	1820 Ft.	185	9 Sites

1.5 INTRODUCTION TO PROJECT

This report is prepared under the Underwater Inspection Program conducted by the Ocean Engineering Project Office (FPO-1), Chesapeake Division, Naval Facilities Engineering Command as part of NAVFAC's specialized Inspection Program. This is a task oriented engineering service program in support of inspection, analysis and design of repairs of the submerged portions of Navy Waterfront Facilities.

This report covers the inspection carried out on Pier 11A at the U.S. Naval Supply Center, San Diego, California. The purpose of the underwater assessment is to provide a generalized structural condition and repair requirements report on the designated facilities within the activity.

A description of the facility, it's location and mission is provided. Detailed results with respect to individual piling, overall assessment of structural condition and recommendations are also given.

1.6 DEFINITIONS: LEVEL I, II INSPECTIONS

Level I: General Inspection: This type of inspection is essentially a "swim-by" overview, which does not involve cleaning of any structural elements, and can therefore be conducted much more rapidly than the other levels of inspection. The Level I inspection should confirm as-built structural plans and detect obvious major damage or deterioration due to overstress (collisions, ice), severe corrosion, or extensive biological growth and attack. The underwater inspector shall generally rely primarily on visual and/or tactile observations (depending on water clarity) to make condition assessments. These observations are normally made over the specified exterior surface area of the underwater structure, whether it is a quaywall, bulkhead, seawall, pile, or mooring. Visual documentation (utilizing underwater television and/or photography), may be included with the quantity and quality adequate for documentation of the findings which will be representative of the facility condition.

Level II: Detailed Inspection: This type of inspection is directed toward detecting and describing damage/deteriorated areas which may be hidden by surface biofouling or deterioration and toward obtaining a limited amount of deterioration measurements. These data should be sufficient to enable gross estimates to be made of facility load capability. Level II inspections will often require cleaning of structural elements. Since cleaning is time consuming, it is generally restricted to areas that are critical or which may be representative of the entire structure itself. The amount and thoroughness of cleaning to be performed is governed by what is necessary to discern the general condition of the overall facility.

Simple instruments such as calipers, measuring scales and ice picks are commonly used to take physical measurements.

However, a small percentage of more accurate measurements may also be taken with more sophisticated instruments for several reasons. These measurements will validate large numbers of simple measurements and in some hard to measure areas, will actually be easier and faster to obtain. Where the visual scrutiny, cleaning, and/or simple measurements reveal extensive deterioration, a small sampling of detailed measurements will enable gross estimates to be made of the structure's integrity. For example, on extensively corroded steel H piles, a small percentage should receive ultrasonic thickness measurements to determine typical cross-section profiles. The cross-sections determined by these spot checks would be used to determine individual H pile load capability which would then be extrapolated to obtain a "ballpark" estimate of overall facility load capability. Visual documentation (utilizing underwater television and/or photography) should be included with the quantity and quality adequate to be representative of the *range of facility damage/deterioration*.

SECTION 2 - ACTIVITY DESCRIPTION

This section provides a general description of the Naval Supply Center, NSC, San Diego. The description includes a brief discussion of the Supply Center's location, mission, facilities and geography. This information which has been extracted from the Government Furnished Information (G.F.I.) installation profile, provides a more overall view of the activity.

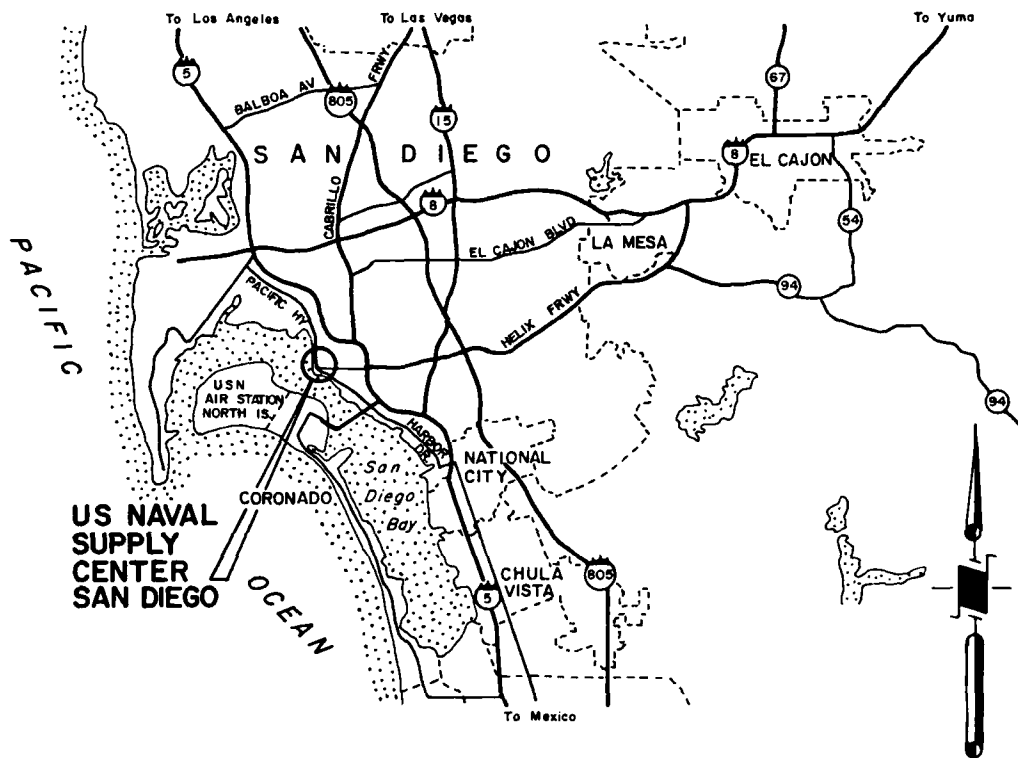
2.1 LOCATION OF ACTIVITY

The Naval Supply Center (NSC), San Diego, occupies a prime location on the waterfront in downtown San Diego between Pacific Highway and Harbor Drive, see Figures 1 and 2. The activity is surrounded by established commercial facilities planned for redevelopment in the near future to enhance their attractiveness and recreational value.

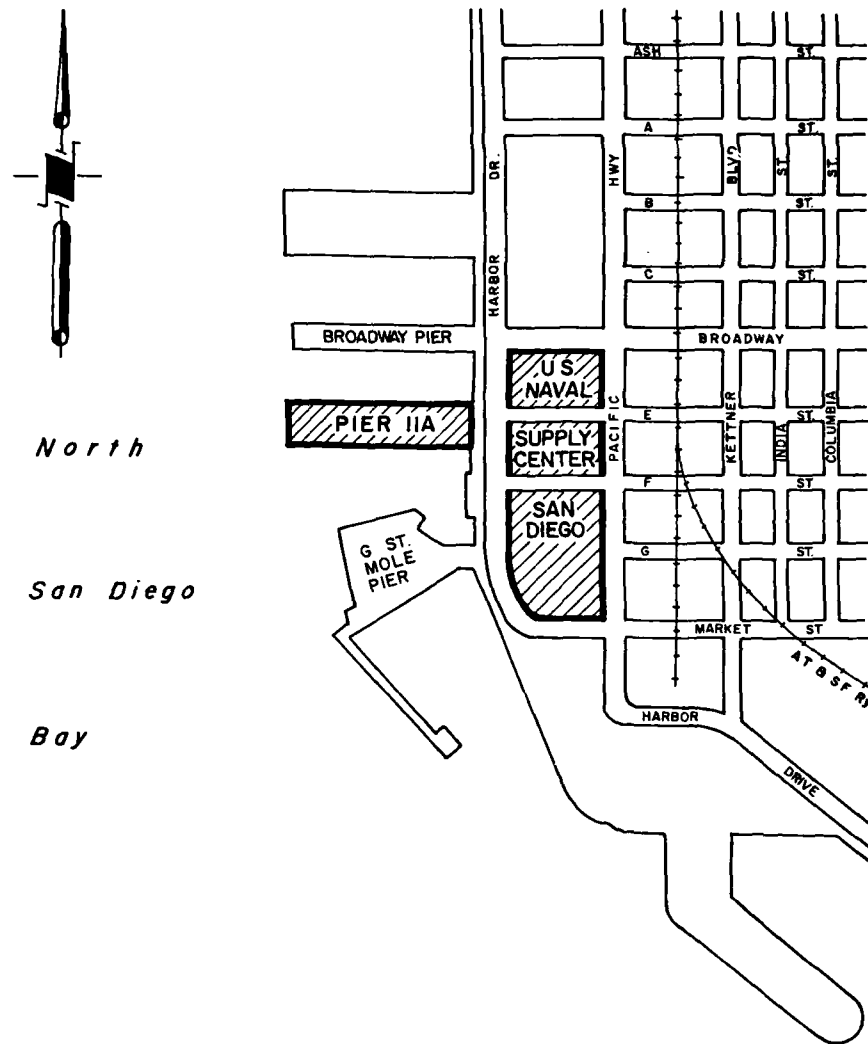
NSC has two annexes in the San Diego area: the National City Annex (NCA), located within the confines of Naval Station (NAVSTA), San Diego, and five miles southeast of the main NSC compound; and the Fuel Department, which is located on the Harbor side of Point Loma, six miles west of the headquarters site. In addition, NSC San Diego operates SERVMARTS at NAS Miramar; NAS North Island; Naval Auxilliary Landing Field (NALF), Imperial Beach; Naval Training Center (NTC), San Diego; Naval Amphibious Base (NAVPHIBASE), Coronado; and at the Fuel Department on Point Loma.

2.2 MISSION OF ACTIVITY

Established in 1922 as a Naval Supply Depot, NSC San Diego is the principal source of supply and material support services for all Naval activities in the study area, including homeported ships. Support is also furnished to all area General Services Administration (GSA) activities, and the Naval Regional Medical Centers at Long Beach and Camp Pendleton.



J. Agi & Associates Co. Ltd. Suite 600, 1414 Alaskan Way, Seattle, WA		CHES DIV NAV FAC ENG COM	
1" = 4 mi.		LOCATION MAP NAVAL SUPPLY CENTER SAN DIEGO, CA	Fig. 1
Sept. 7, 1983.			



J. Agi & Associates Co. Ltd. Suite 600, 1414 Alaskan Way, Seattle, WA		CHES DIV NAV FAC ENG COM	
1" = 800'		SITE PLAN NAVAL SUPPLY CENTER SAN DIEGO, CA	
Sept. 7, 1983.		Fig. 2	

The National City Annex and Point Loma Fuel Department date from 1942, but were in use many years earlier, under other organizational identities.

The main compound, downtown, contains the activity headquarters; bulk and bin warehouse storage; hazardous, flammable, and cold storage; packing and preservation facilities; transit shed and supply pier; in transit personal property storage; maintenance facilities; and various personnel training and support facilities.

The supply pier at the main NSC compound serves as a terminal for overseas shipment and retrograde receipt of cargo and material. Each month approximately 3,000 tons of material are received and 9,500 tons are shipped to overseas destinations. Total rail and truck transactions for NSC in FY 1973 approximated 600,000 tons. The NSC-NCA processes 60 percent of all land-borne transactions by tonnage, the majority of which are made by truck.

2.3 GEOGRAPHY OF ACTIVITY

Topography: Within the City of San Diego land elevations range from sea level to 1,590 feet. Both the City and the San Diego metropolitan area lie almost entirely within the coastal plain terminated by the Peninsula Range to the east. The coastal plain, varying in width from 10 to 20 miles, has irregular topography characterized more by rolling hills than mesas. Numerous canyons serrate the mesas. Mt. Woodson, rising to 3,894 feet, has the highest elevation within the metropolitan area. Land within the San Diego Naval Complex rises gradually from the ocean through a series of low ridges, hills and canyons to the eastern end of the Complex where the elevation averages approximately 500 feet above sea level at the southern end.

SECTION 3 - INSPECTION PROCEDURE

An underwater inspection of Pier 11A at the Naval Supply Center, San Diego, was carried out during the time period August 22 - 31, 1983. The level of inspection to be carried out as detailed in the scope of work, the type of structure being inspected, on site environmental and structural conditions and past experience, dictated the inspection procedures that were employed on this project.

3.1 LEVEL OF INSPECTION

Levels I and II inspections were carried out on the structure as indicated by on site conditions and the scope of work as defined under Task 3 of this Contract. This included visual/tactile inspection techniques and cleaning or removing of biofouling from certain members as required. In addition, photographic documentation of typical conditions and/or damage was obtained.

3.2 INSPECTION PATTERN/PROCEDURE

A Level I inspection was performed on 100% of the piles within Pier 11A. Special emphasis was placed on all perimeter piles. Additional Level I inspection involved examination of the concrete sheet pile bulkhead which encloses a good deal of the interior portion of pierhead. This bulkhead was examined along its face at three levels: mudline, just below MLW and in the splash zone. Seams or joints and the base of the bulkhead were examined for holes or splits and loss of fill material.

A Level II inspection was performed on 10% of the bearing piles within Pier 11A and every 200 lineal feet on the concrete sheet pile (at the interlock regions). The Level II inspection involved cleaning of piles at three (3) elevations in the following manner:

Concrete Bearing Pile: Band cleaned of biofouling or debris on three sides or faces of each pile to an approximate length of 10 inches to expose underlying pile surface for inspection at three heights; mean low water (MLW), mudline (ML) and halfway between MLW and ML. (See Photographs 1, 2 and 3).

Concrete Sheet Pile: Twelve inch square area cleaned from the interlock region of the sheet pile at three heights; MLW, ML and halfway between MLW and ML. (See Photograph 4).

The general pattern of inspection to be followed and the specific location of piles to be inspected and cleaned was determined by mutual agreement between the contractor and the on site government representative. That decision was based on the Level I findings.

3.3 EQUIPMENT

- Short handled scrapers and hatchets for cleaning concrete piles.
- Steel rulers for measurement of extent of deteriorated concrete.
- Nikonos IV-A underwater camera and strobe.
- Clearwater box for underwater photography.
- Miscellaneous ancillary equipment and SCUBA gear.

3.4 PERSONNEL ON PROJECT

Jerry Agi	- Project Manager
Erling Vegsund	- Project Supervisor
Scott Christie	- Engineering Technician
Fred Phillips	- Technician/Draftsman
Douglas Cassidy	- Technician
Maria Sjoquist	- Report Preparation



PHOTOGRAPH NO. 1

Diver removing marine fouling organisms from Pile 63S-2 for Level II inspection.



PHOTOGRAPH NO. 2

Level II cleaning of Pile 43S-5. Note good condition of pile and density of marine fouling organisms in submerged zone.



PHOTOGRAPH NO. 3
Level II cleaning of Pile 33S-2 at mudline.



PHOTOGRAPH NO. 4
Level II cleaning of concrete sheet pile at Site 4.

SECTION 4 - FACILITY INSPECTED

4.1 FACILITY INSPECTED

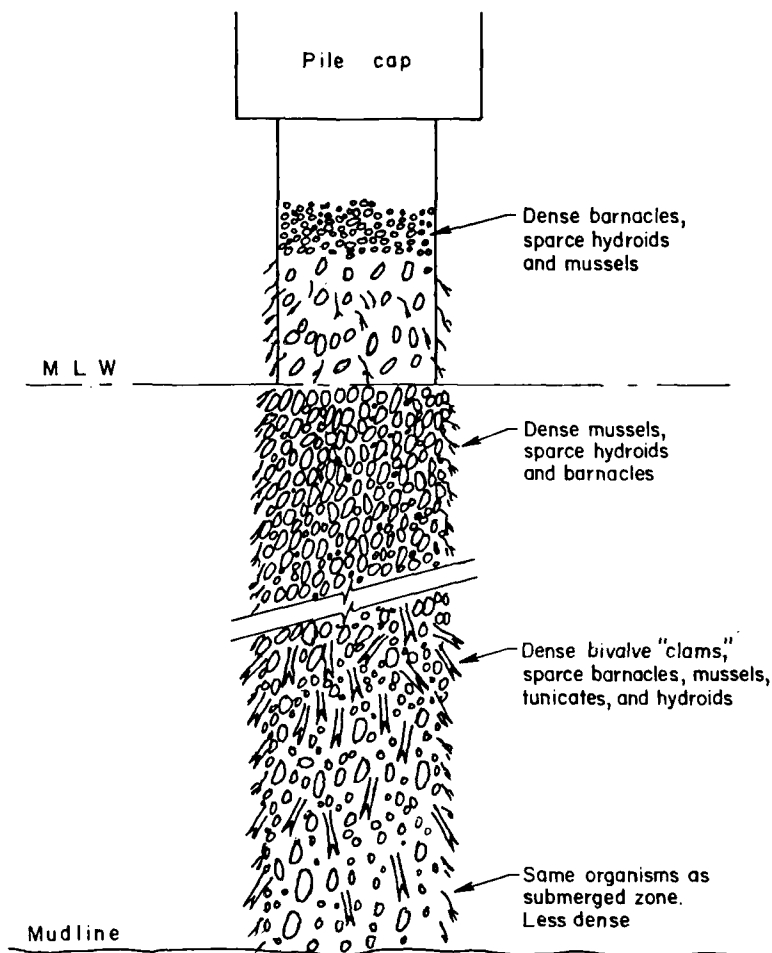
The results of the inspection of Pier 11A at the Naval Supply Center, San Diego is detailed in this section of the report. The discussion of the facility is presented in four sections: (1) A description of the overall facility and its operations as well as a specific detailing of the construction and identification of the examined piles; (2) A detailing of the observed condition of the facility as determined by the field inspection; (3) A quantitative assessment of the structural condition of the facility based on the observed condition; and (4) Recommendations for maintenance to ensure the structural integrity of the facility. Tables detailing the condition of the inspected piles as well as cost breakdowns for any necessary repairs are included in the accompanying appendices.

Water depths ranged from intertidal along the concrete sheet wall bulkhead to approximately 30 - 35 feet at the perimeter piles. Underwater visibility during the inspection ranged from fair to good.

Marine growth or fouling profiles were found to be similar throughout the structure. Organisms found on or near the structure include barnacles, mussels, bivalve clams, hydroids and tunicates. In addition, several species of fish, crabs and lobsters were observed. The fouling organisms attached to the piles or concrete bulkhead were found to range from the upper intertidal zone to the mudline. Specifically they were found to range as follows:

Upper Intertidal Zone:	Dense barnacles, sparse hydroids and mussels
Mid - Lower Intertidal Zone:	Dense mussels, sparse hydroids and barnacles
Submerged Zone to Mudline:	Dense bivalve "clams", sparse barnacles, mussels, tunicates and hydroids

The following Figure No.3 and Photographs 5 - 8 serve to illustrate the typical organisms found in the structure.

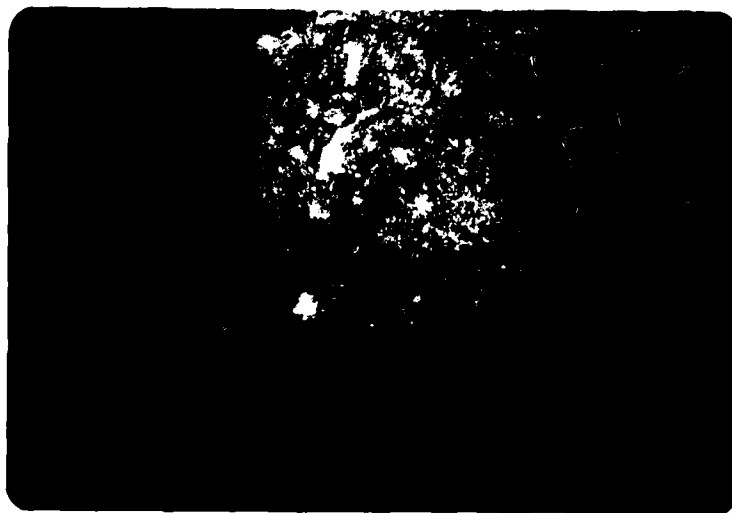


J. Agi & Associates Co. Ltd. Suite 600, 1414 Alaskan Way, Seattle, WA	CHES DIV NAV FAC ENG COM	
	MARINE GROWTH PROFILE NAVAL SUPPLY CENTER SAN DIEGO, CA	Fig. 3
Not to scale	Sept 7, 1983.	



PHOTOGRAPH NO. 5

Pile 33S-2. Fouling organisms in upper mid intertidal zone. Note dense barnacles and sparse mussels and brown hydroids.



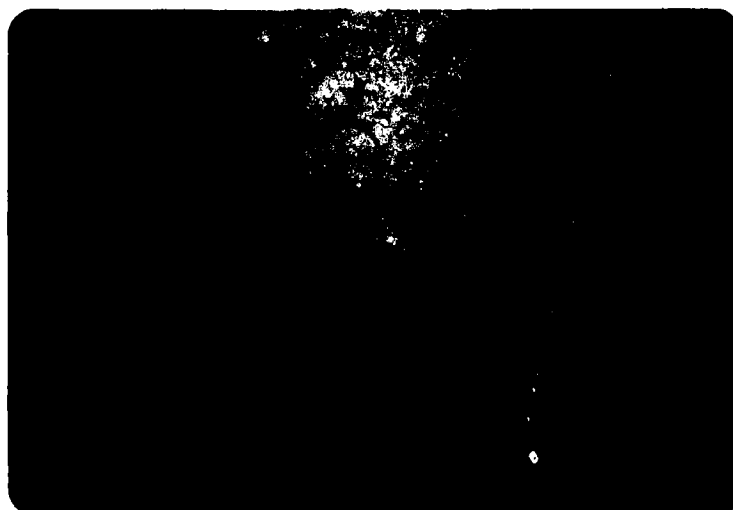
PHOTOGRAPH NO. 6

Pile 33S-2. Fouling organisms in mid intertidal to upper submerged zone. Note dense mussels with sparse barnacles and brown hydroids.



PHOTOGRAPH NO. 7

Pile 33S-2. Fouling organisms in submerged zone including dense bivalve clams, tunicates, barnacles, mussels and hydroids.



PHOTOGRAPH NO. 8

Pile 33S-2. Fouling organisms at mudline. Note the same organisms as in the submerged zone, however, the coverage is less dense. Also note soft silty mudline.

4.2 DESCRIPTION OF STRUCTURE

Pier 11A, the supply pier at the Main Naval Supply Center (NSC) compound is located near the corner of Broadway and Harbor Drive in downtown San Diego. The pier which was constructed in the early 1920's, is built on concrete piles and a concrete seawall or bulkhead. The pier is oriented in an approximate east-west direction perpendicular to the shore.

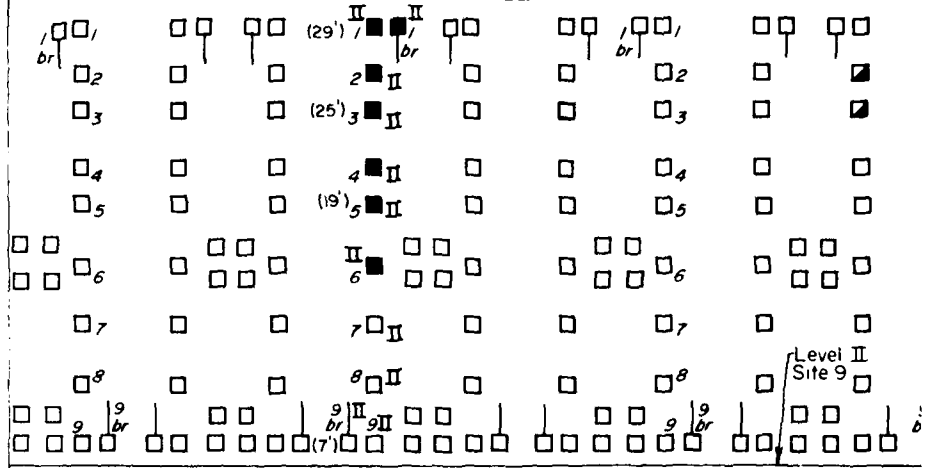
As illustrated in Photograph No.9, the pier supports a two story warehouse used for storage and transshipping of N.S.C. cargo. The warehouse is supported on hydraulic fill retained by a cast in place cantilevered concrete retaining wall. This wall is illustrated on Photograph No.10 and on Drawings 1 - 3. The shoreward and loading apron sections of the pier are constructed on 20" X 20" concrete piles. These piles are in bents set at 13' 6" on center, these members are capped by 12" X 27" concrete caps. As shown in Photograph No.11 and Drawing 3, cross beams or stringers (12" X 14" concrete) are spaced at 5 and 8 foot centers to coincide with the concrete piles (rows).

The total number of piles in the structure is estimated at 1847. As shown in Drawings 1 and 2, these piles are identified by a standard bent-row grid system. The pile bents are designated by consecutive numbers 1 - 78 from the east. In the eastern and western ends of the structure (i.e. where no seawall exists) the piles are designated by consecutive numbers. In the warehouse section the pile rows are designated as north or south and are numbered consecutively from the pier face to the concrete bulkhead.

As shown on Drawing 1, a concrete sheet pile wall extends from the approximate center of the eastern end of the warehouse to the shore. This wall is made up of individual 8" X 20" concrete piles and is capped by and 18" X 20" concrete cap. This wall which does not support the structure appears to function as a breakwater or barrier.

36N 35N 34N 33N 32N 31N 30N 29N 28N

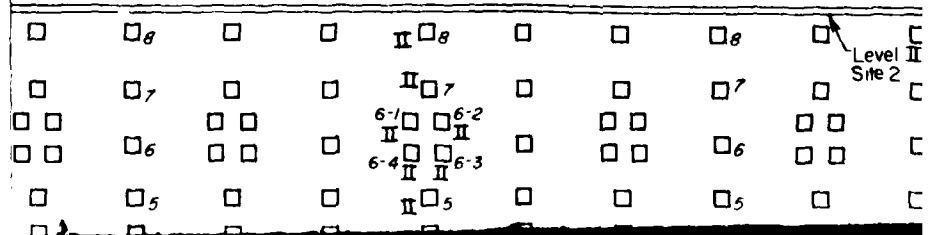
(35')



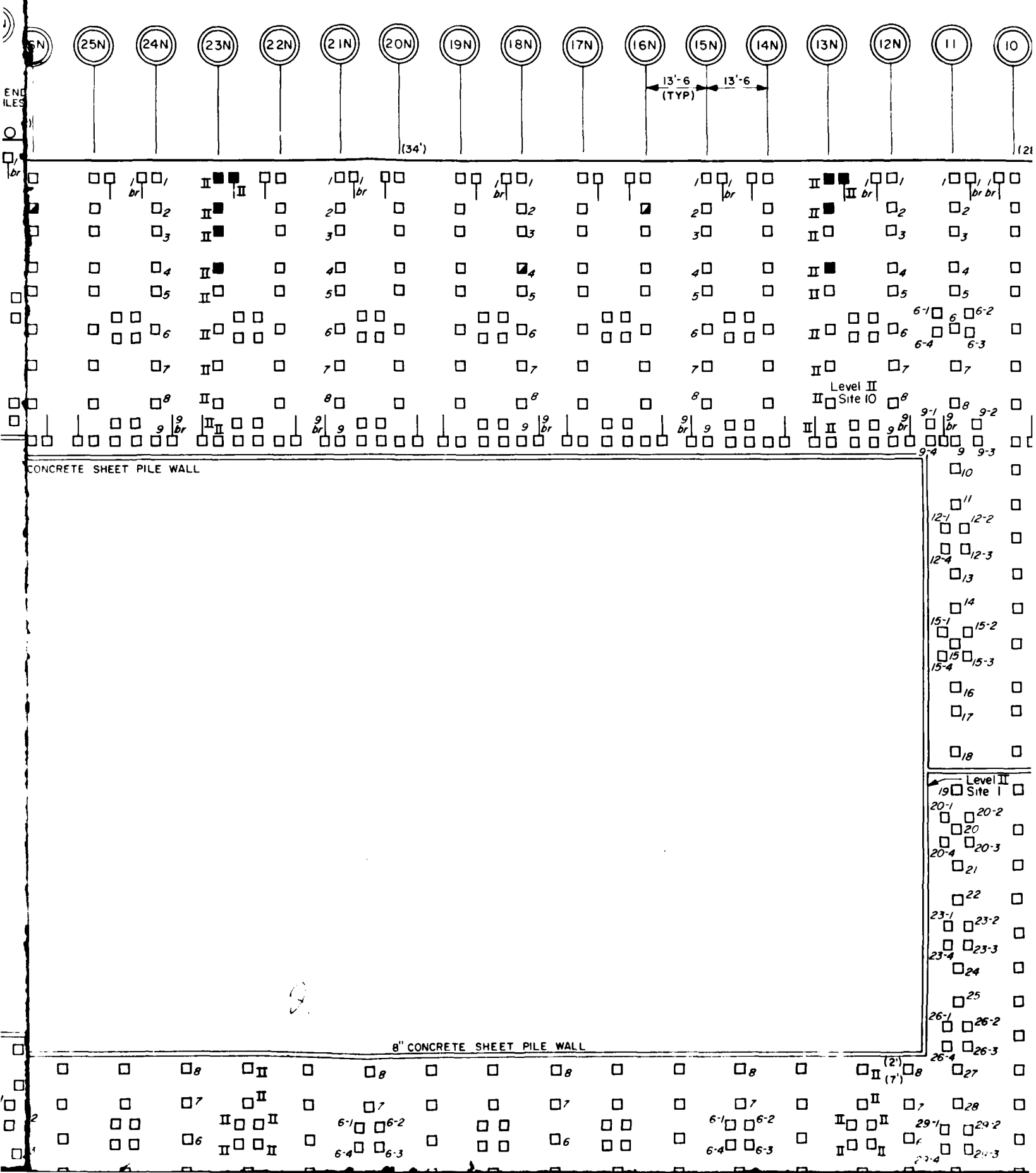
Level II
Site 9

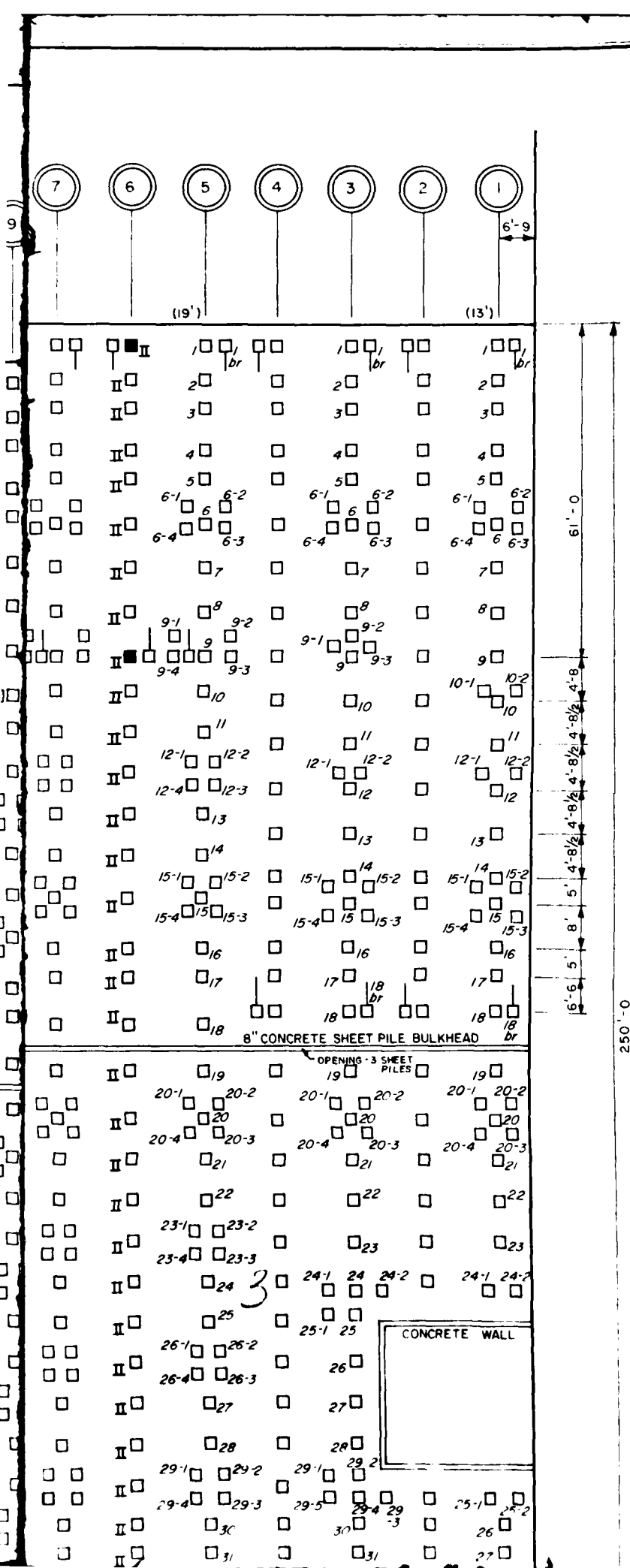
Continued on Dwg. No. 2

MATCH LINE



Level II
Site 2





LEGEND



BENT No.

7

PILE ROW DESIGNATION



20"x20" CONCRETE PILE



20"x20" CONCRETE BATTER PILE



PILE CUT-OFF

NP

NEW PILE

m

PILE MISSING

(30')

PILE LENGTH, CAP TO MUDLINE

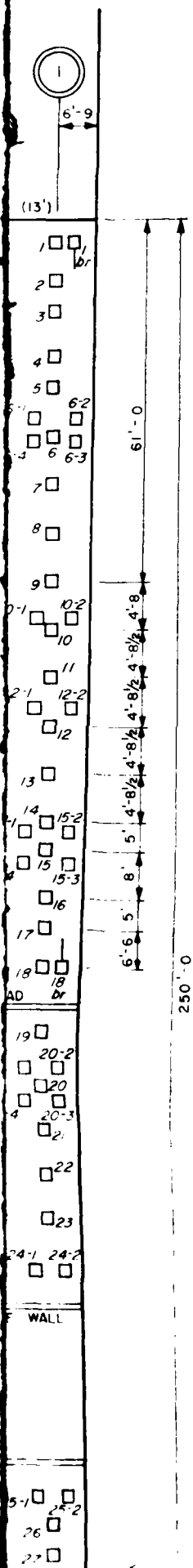
INSPECTION LEVEL DESIGNATIONS

LEVEL I - all piles subjected to Level I inspection
- concrete bulkhead, entire length

☐ SIGNIFICANTLY DAMAGED PILE, LEVEL I

LEVEL II - inspected piles indicated by (II)

■ SIGNIFICANTLY DAMAGED PILE, LEVEL II



LEGEND



BENT No.

7

PILE ROW DESIGNATION



20"x20" CONCRETE PILE



20"x20" CONCRETE BATTER PILE



PILE CUT-OFF

NP

NEW PILE

m

PILE MISSING

(30')

PILE LENGTH, CAP TO MUDLINE

INSPECTION LEVEL DESIGNATIONS

LEVEL I - all piles subjected to Level I inspection
- concrete bulkhead, entire length

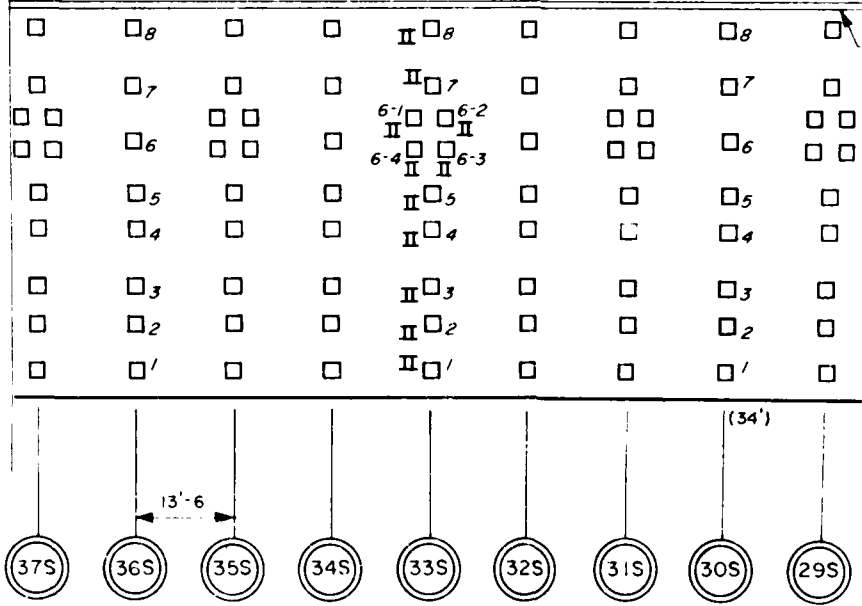
■ SIGNIFICANTLY DAMAGED PILE, LEVEL I

LEVEL II - inspected piles indicated by (II)

■ SIGNIFICANTLY DAMAGED PILE, LEVEL II

4

MATCH LINE

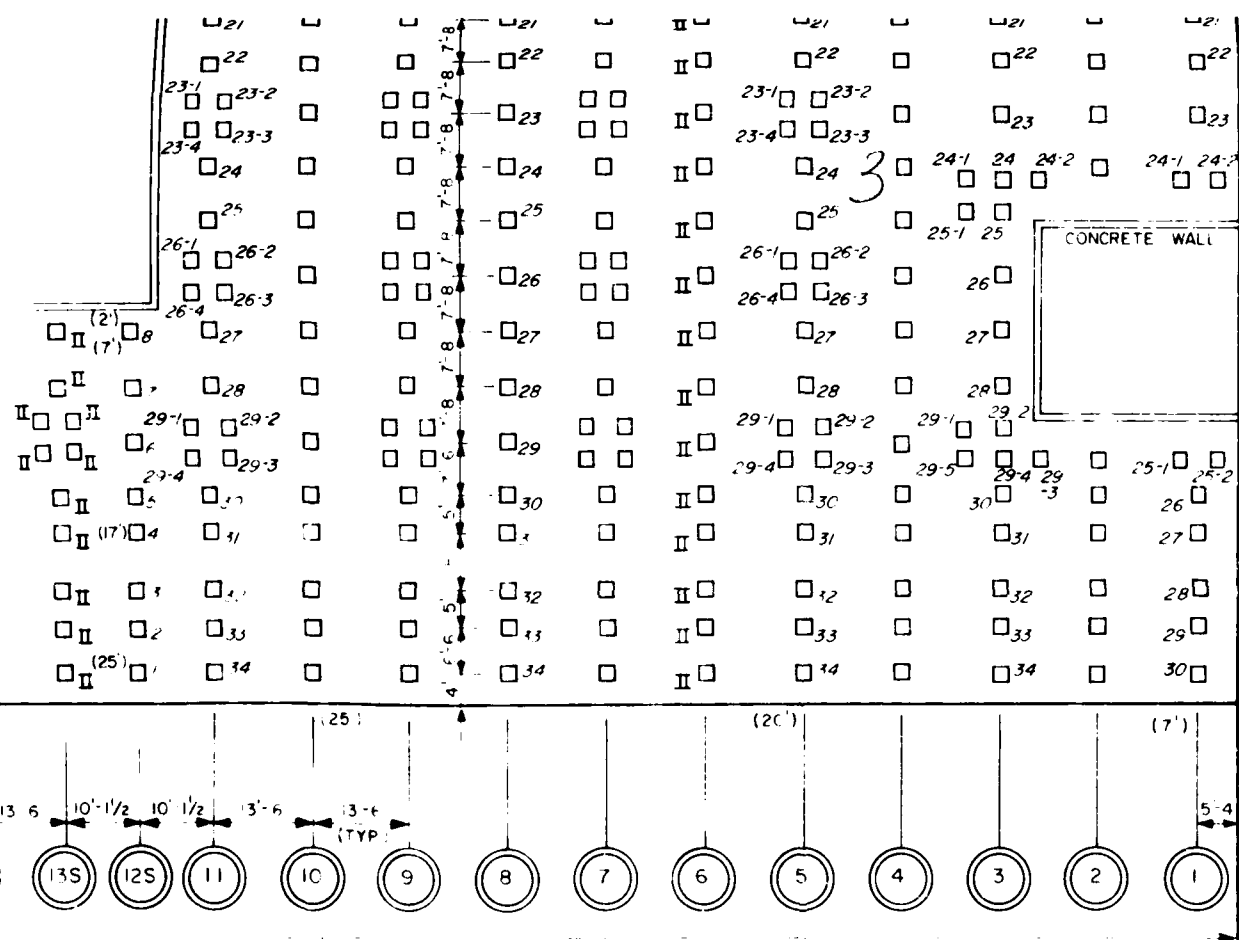


Continued on
Dwg No. 2

5

[illegible]

987' - 10



Refer

J. AGI &
Suite 600

PL.
AND COND

U.S.
S

CHE
REPO
CONTRAI

7

Reference Dwgs. Navfac Dwg No 1203509, sheets 1-22

J. AGI & ASSOCIATES CO. LTD.
Suite 600, 1414 Alaskan Way, Seattle, WA

PLAN SHOWING LOCATION
AND CONDITION OF INSPECTED PILING IN
PIER IIA
U.S. NAVAL SUPPLY CENTER
SAN DIEGO, CALIFORNIA

CHES DIV NAV FAC ENG COM
REPORT No. FPO-1-83-(43)
CONTRACT No. N62477-81-C-0498
TASK 3

DWG. No. 1

SCALE 1" = 20'

DRAWN F.P.

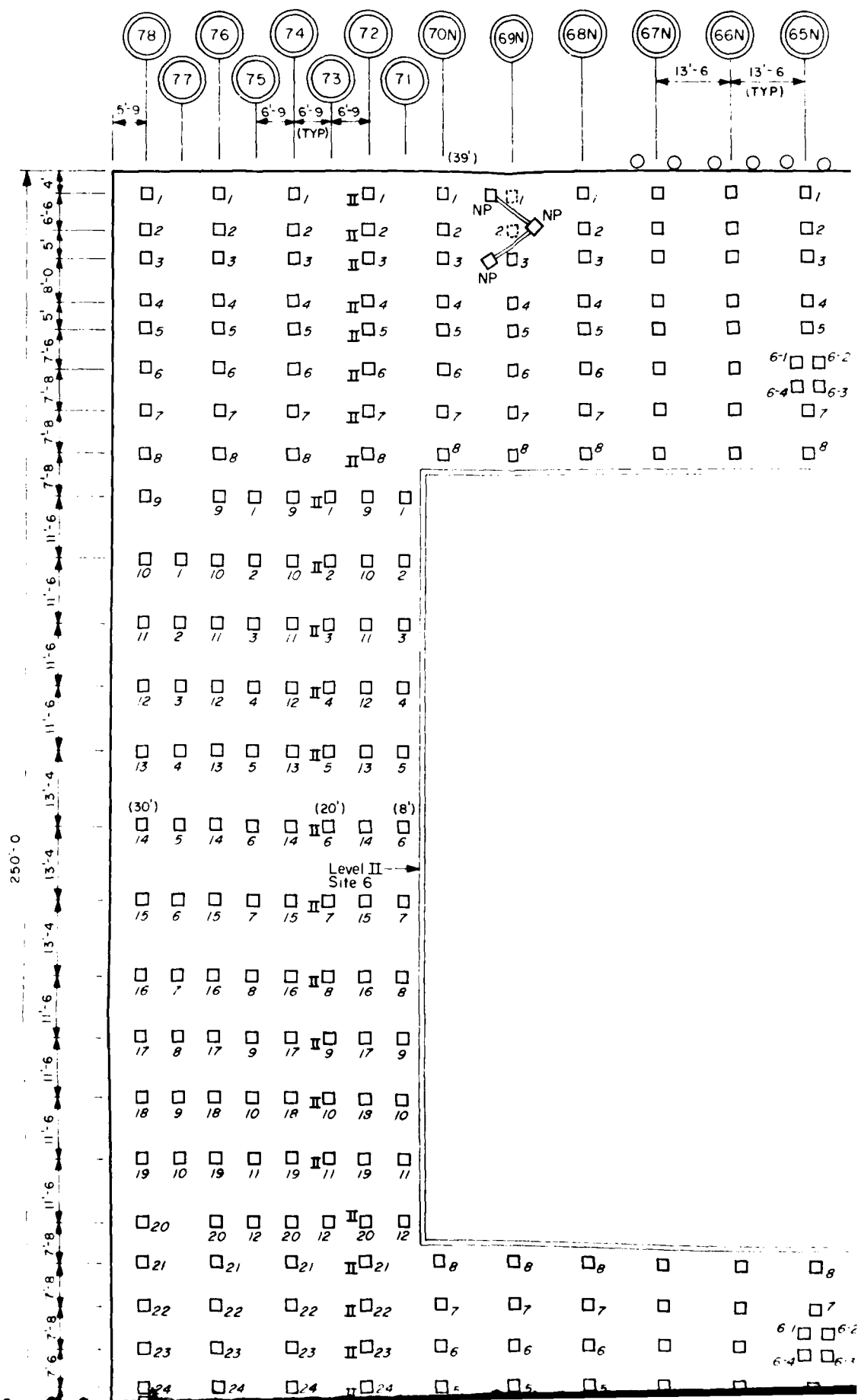
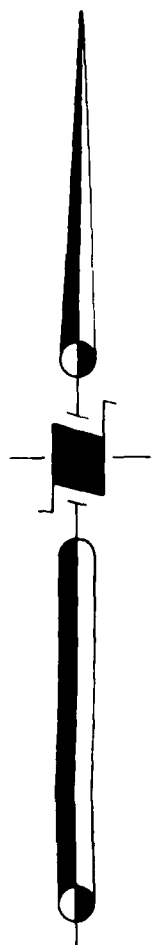
CHECKED J.F./

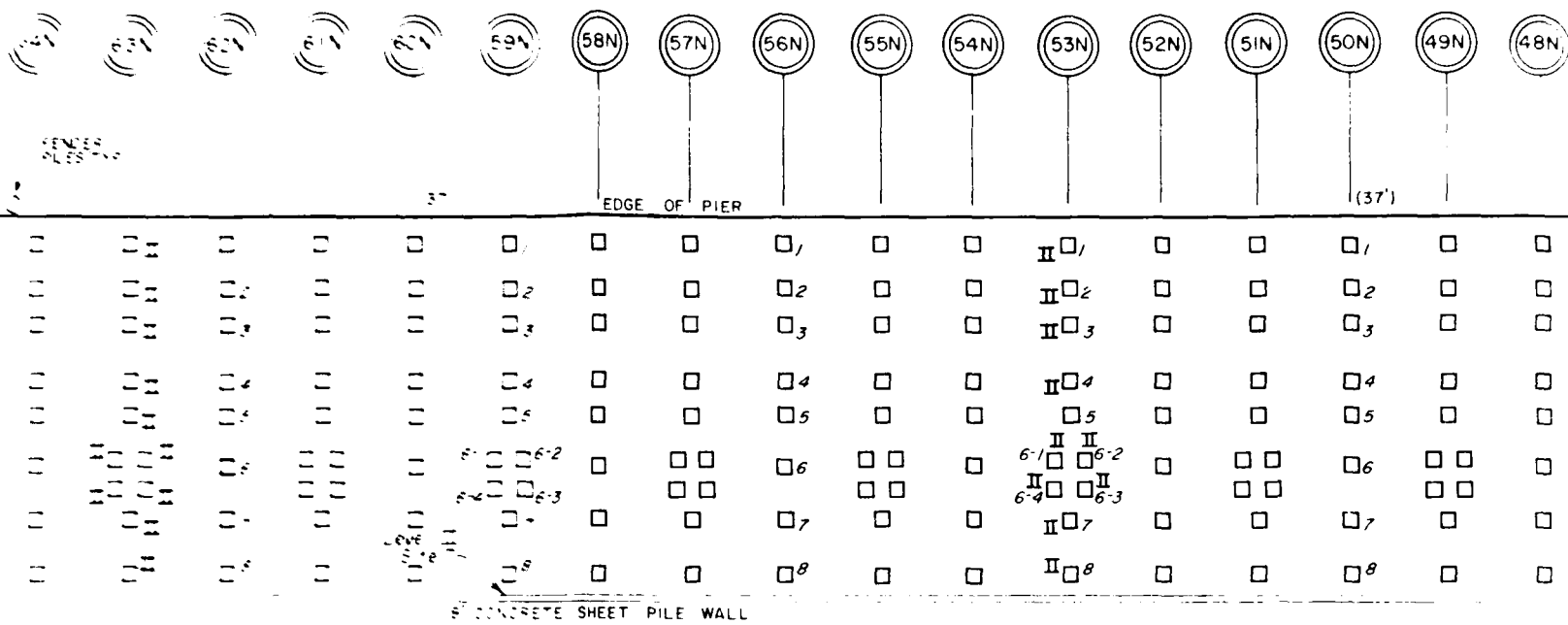
APPROVED JA

DATE SEPT. 22, 1983.

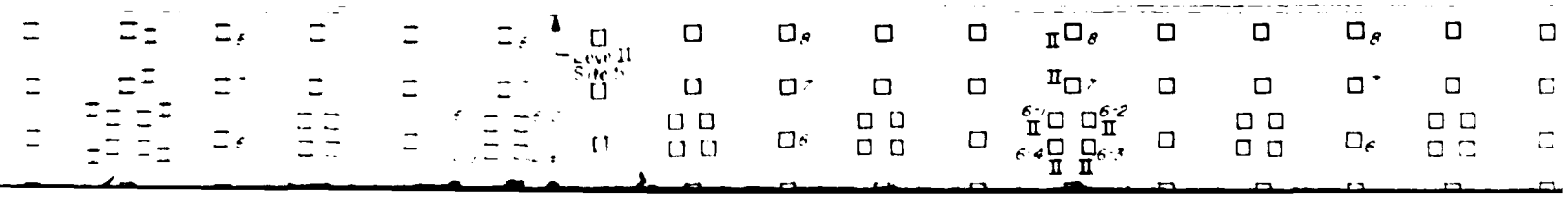
PROJECT No

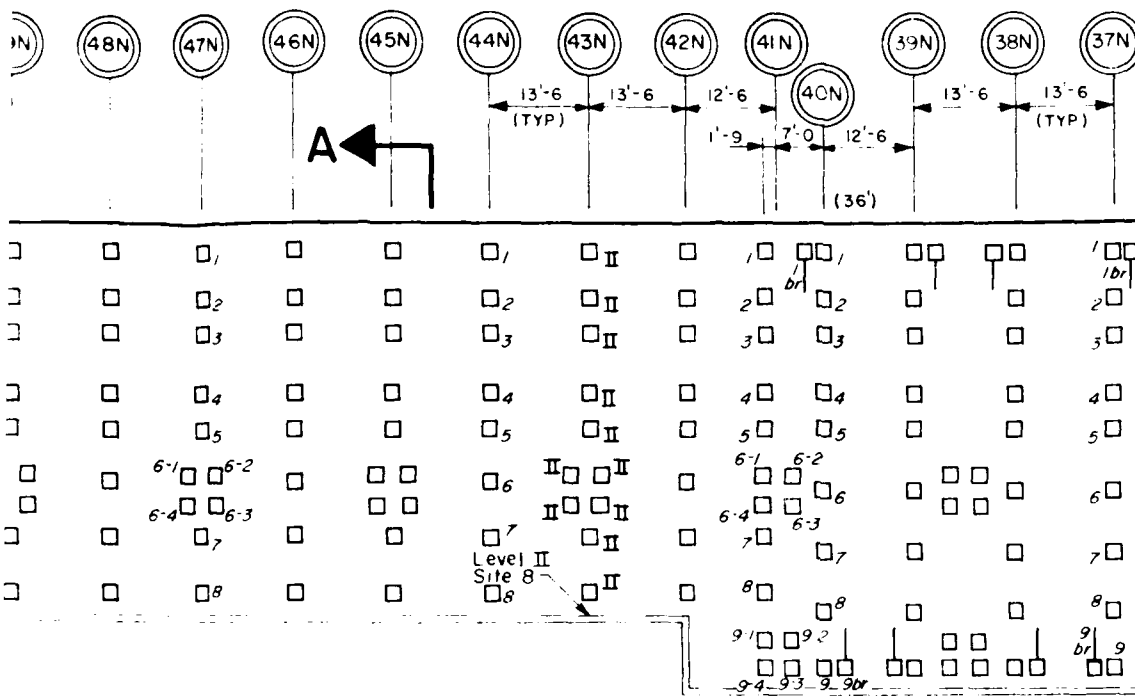
83-3-2-121





8' CONCRETE SHEET PILE WALL





(54S)

LEGEND

BENT NO.

23

PILE ROW

□

20" x 20"

□

20" x 20"

□

PILE CL

NP

NEW PILE

m

PILE M

(30')

PILE LE

INSPECTION LEVEL

LEVEL I - all

- CO



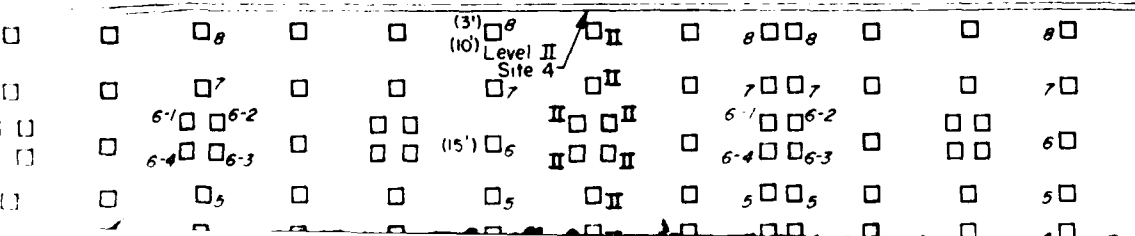
LEVEL II - in

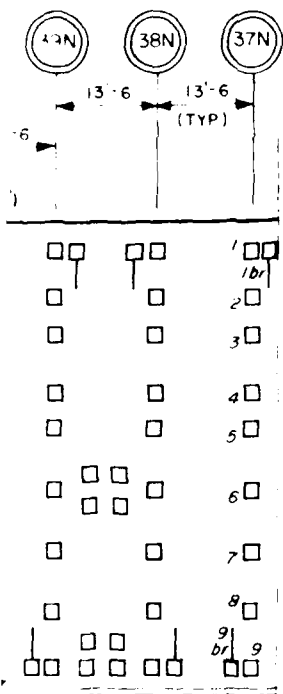


MATCH LINE

Continued on Dwg. No. 1

3





LEGEND



BENT No

23

PILE ROW DESIGNATION



20" x 20" CONCRETE PILE



20" x 20" CONCRETE BATTER PILE



PILE CUT-OFF

NP

NEW PILE

m

PILE MISSING

(30')

PILE LENGTH, CAP TO MUDLINE

INSPECTION LEVEL DESIGNATIONS

LEVEL I - all piles subjected to Level I inspection
- concrete bulkhead, entire length

■ SIGNIFICANTLY DAMAGED PILE, LEVEL I

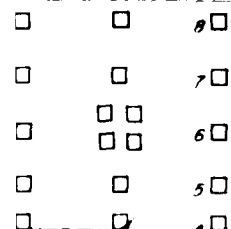
LEVEL II - inspected piles indicated by (II)

■ SIGNIFICANTLY DAMAGED PILE, LEVEL II

MATCH LINE

Continued on Dwg. No. 1

4

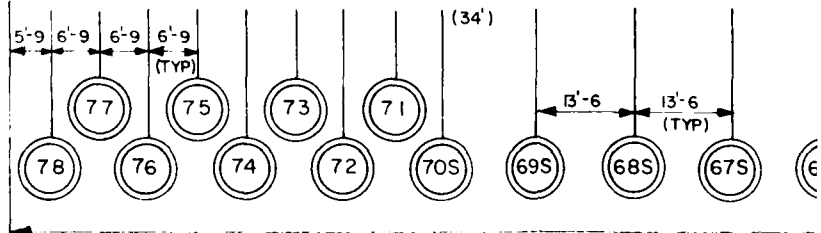




250'-0

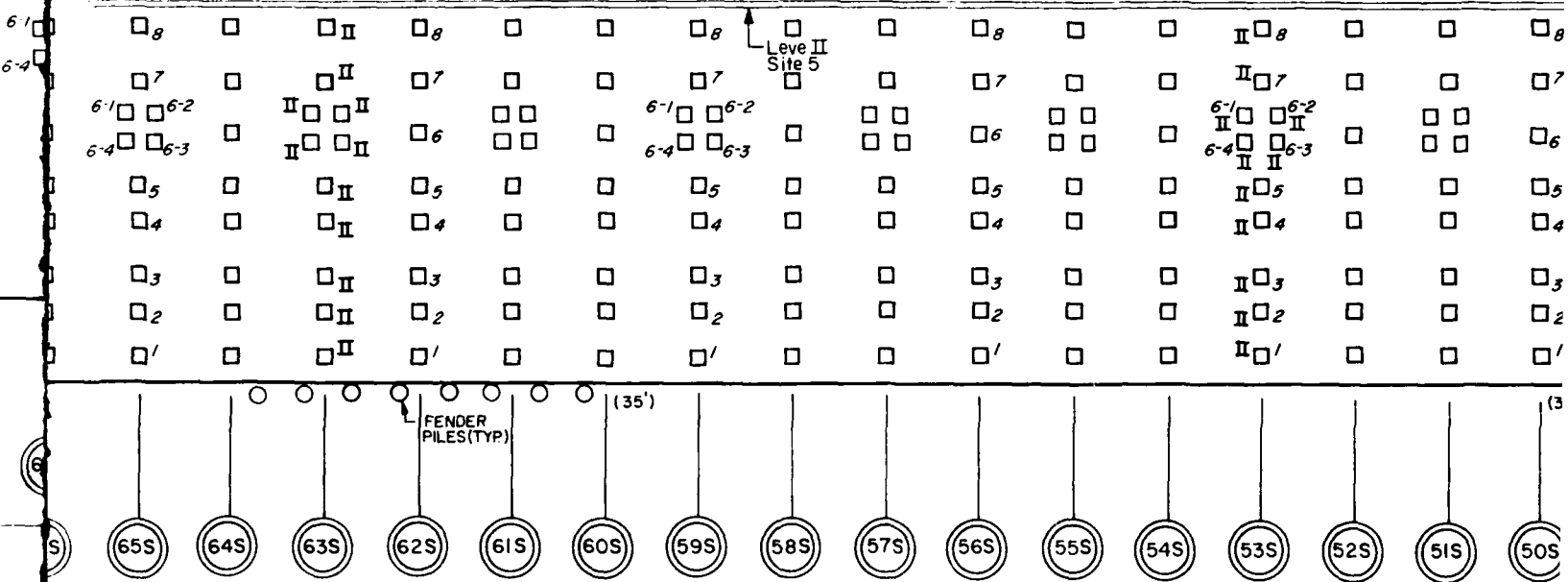
11'-4
13'-4
13'-4
13'-4
11'-6
11'-6
11'-6
11'-6
7'-8
7'-8
7'-8
7'-6
5'-0
8'-0
5'-6
5'-6
4'-6

13	4	13	5	13	5	13	5
(30')				(20')		(8')	
14	5	14	6	14	6	14	6
				Level II			
				Site 6			
15	6	15	7	15	7	15	7
16	7	16	8	16	8	16	8
17	8	17	9	17	9	17	9
18	9	18	10	18	10	18	10
19	10	19	11	19	11	19	11
20	20	12	20	12	20	12	
21	21	21	II	21	8	8	8
22	22	22	II	22	7	7	7
23	23	23	II	23	6	6	6
24	24	24	II	24	5	5	5
NP	25	25	II	25	4	4	4
26	26	26	II	26	3	3	3
27	27	27	II	27	2	2	2
28	28	28	II	28	1	1	1



2

8" CONCRETE SHEET PILE WALL

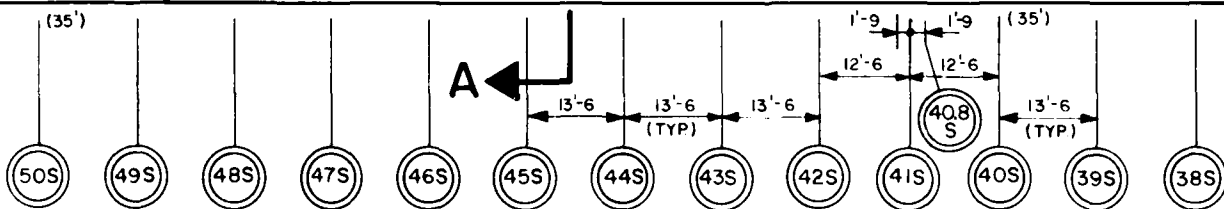
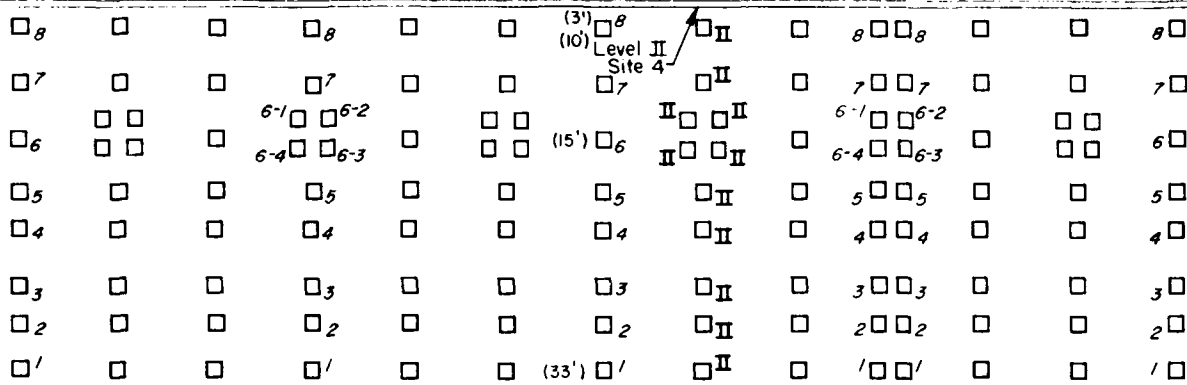


6

MATCH LINE

Continued on Dwg. No. 1

3



987'-10

Continued on
Dwg. No. 1

Re

J. AGI &
Suite 6C

F
AND COM
U

CH
REI
CONF

■ SIGNIFICANTLY DAMAGED PILE, LEVEL I

LEVEL II - inspected piles indicated by (II)

■ SIGNIFICANTLY DAMAGED PILE, LEVEL II

MATCH LINE

Continued on Dwg. No. 1

4

□	8 □
□	7 □
□ □	6 □
□	5 □
□	4 □
□	3 □
□	2 □
□	1 □

5'

3'-6"
(TYP)



Continued on
Dwg. No. 1

Reference Dwgs. - Navfac Dwg. No. 1203509, sheets 1-22

J. AGI & ASSOCIATES CO. LTD.

Suite 600, 1414 Alaskan Way, Seattle, WA

PLAN SHOWING LOCATION
AND CONDITION OF INSPECTED PILING IN
PIER IIA
U.S. NAVAL SUPPLY CENTER
SAN DIEGO, CALIFORNIA

CHES DIV NAV FAC ENG COM
REPORT No. FPO-1-83 - (43)
CONTRACT No. N62477-81-C-0498
TASK 3

DWG. No. 2

SCALE 1" = 20'

DRAWN F.P.

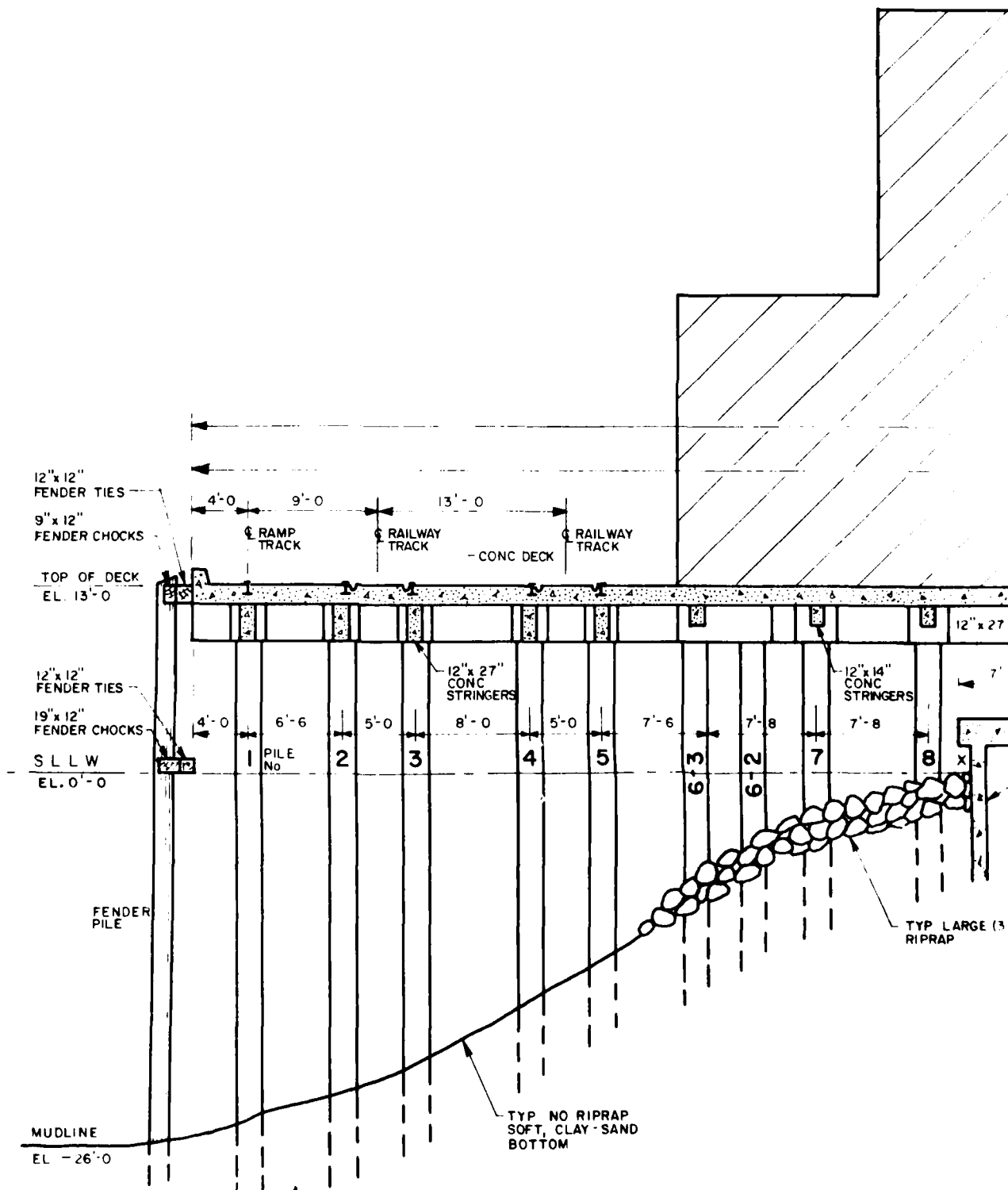
CHECKED E.P.

APPROVED J.A.

DATE SEPT. 22, 1983.

PROJECT No

83-3-2-121



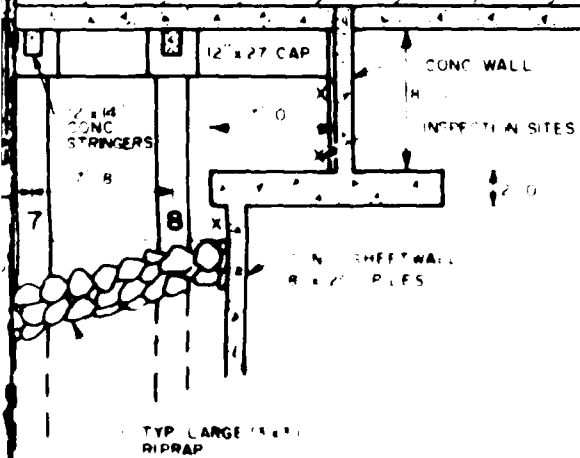
T R A N S I T

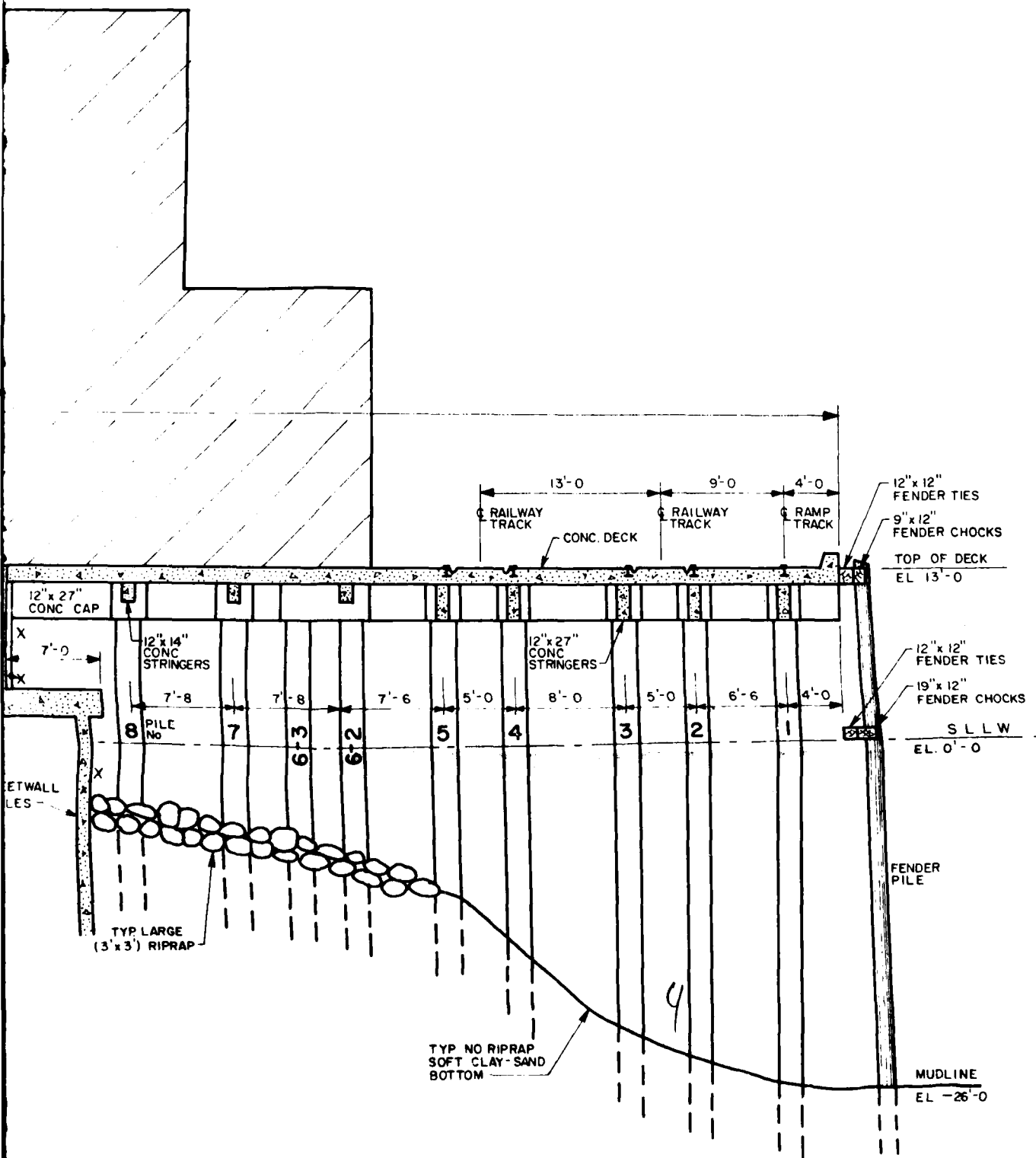
250'-0

125'-0

HYDRAULIC

SECTION A-
BENT 45N-





12"x12"
FENDER TIES

9"x12"
FENDER CHOCKS

TOP OF DECK
EL 13'-0"

12"x12"
FENDER TIES

19"x12"
FENDER CHOCKS

S L L W
EL 0'-0"

FENDER
PILE

MUDLINE
EL -26'-0"

4'-0" 9'-0"

13'-0"

RAMP
TRACK

RAILWAY
TRACK

- CONC DECK

RAILWAY
TRACK

12"x27" CA

12"x27"
CONC
STRINGERS

12"x14"
CONC
STRINGERS

7'-0"

4'-0" 6'-6"

5'-0"

8'-0"

5'-0"

7'-6"

7'-8"

7'-8"

PILE
No

2

3

4

5

6-3

6-2

7

8

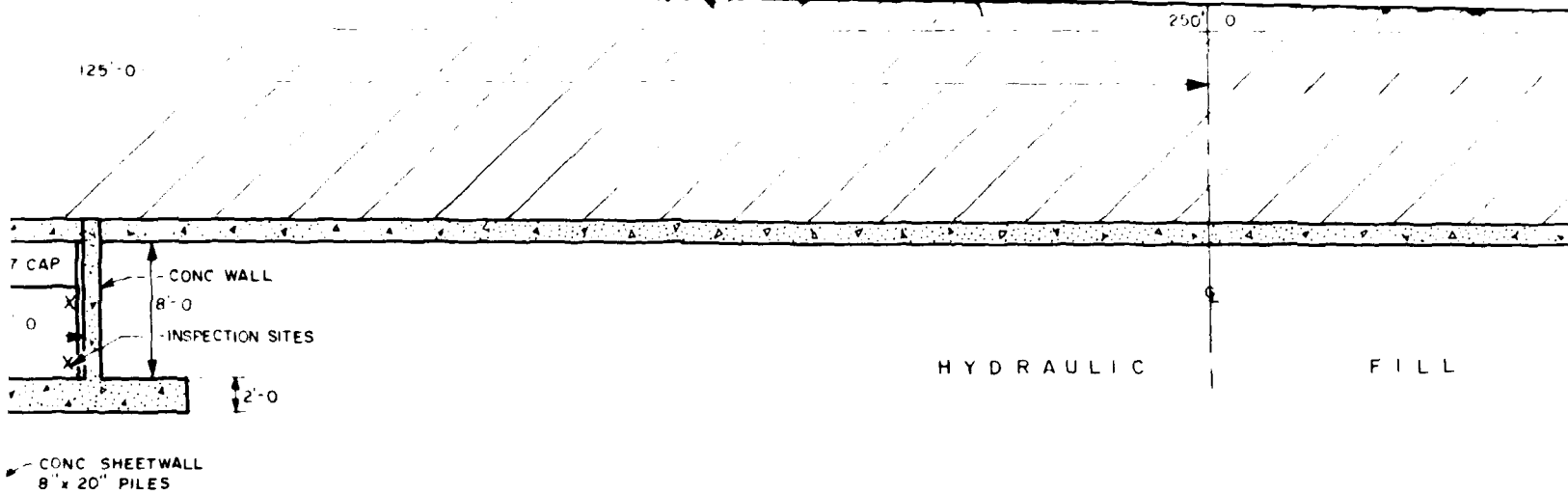
X

CO
8

TYP LARGE (3'x3')
RIPRAP

TYP NO RIPRAP
SOFT, CLAY-SAND
BOTTOM

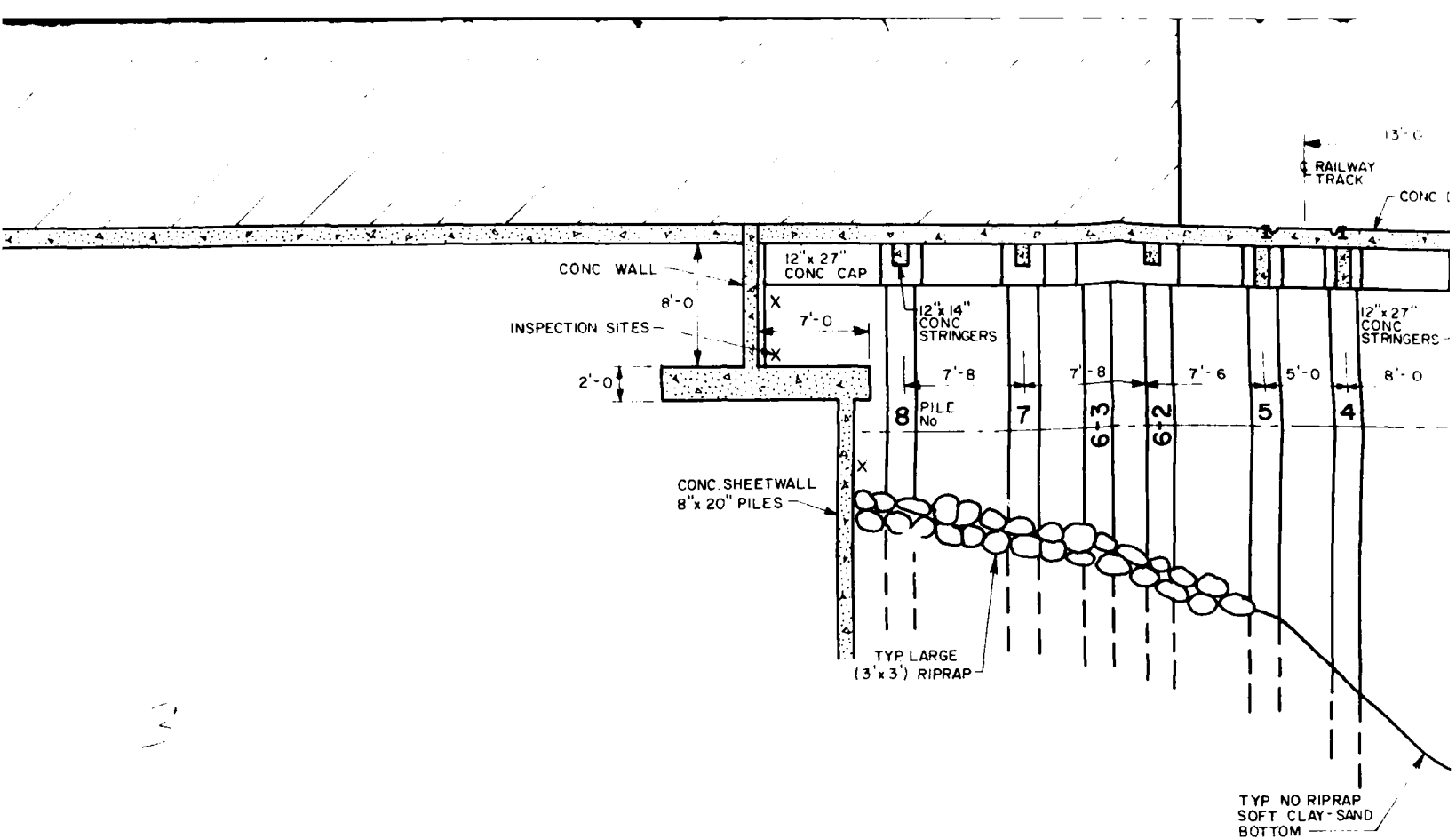
5



SECTION A-A
BENT 45N-S

(3 x 3')

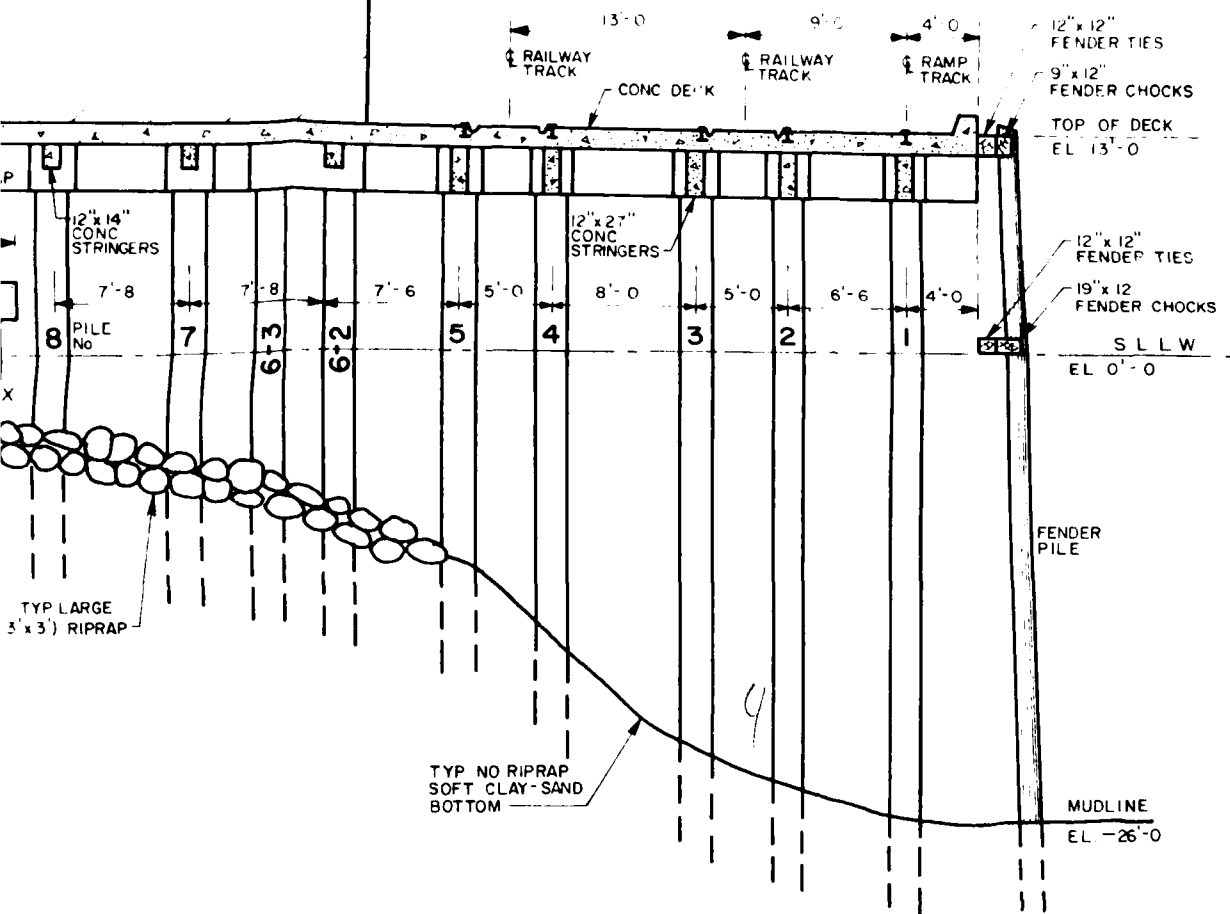
6



Reference Dwgs: No

J. AGI & ASSOCIATES
Suite 600, 1414 Alaskan

PLAN SHOWING CF
PIER 1
U.S. NAVAL SUPPLY
SAN DIEGO, CA
CHES DIV NAV FA
REPORT No FPO
CONTRACT No N624
TASK
DWG. N



Reference Dwg: Navfac Dwg. No. 1203509, sheets 1-22

J. AGI & ASSOCIATES CO. LTD.
Suite 600, 1414 Alaskan Way, Seattle, WA

PLAN SHOWING CROSS-SECTION
PIER IIA
U.S. NAVAL SUPPLY CENTER
SAN DIEGO, CALIFORNIA
CHES DIV NAV FAC ENG COM
REPORT No. FPO-1-83-(43)
CONTRACT No. N62477-81-C-0498
TASK 3
DWG. No. 3

SCALE 1/8" = 1'-0"

DRAWN F.P.

CHECKED E.P.J.

APPROVED JA

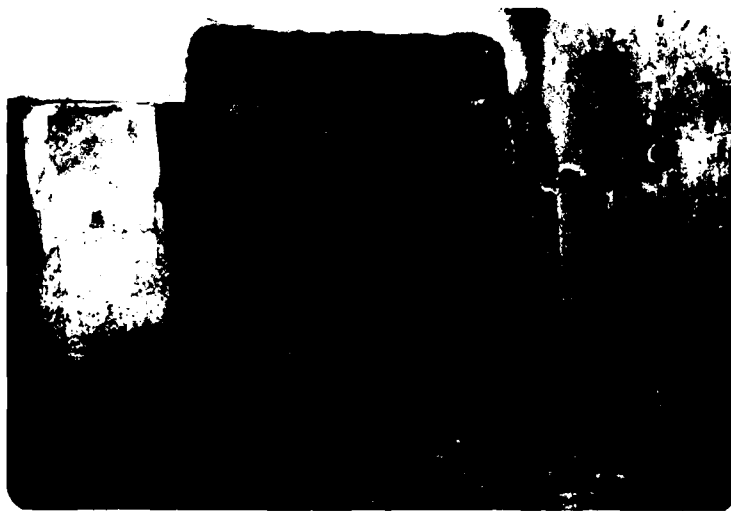
DATE SEPT. 23, 1983.

PROJECT No
83-3-2-121



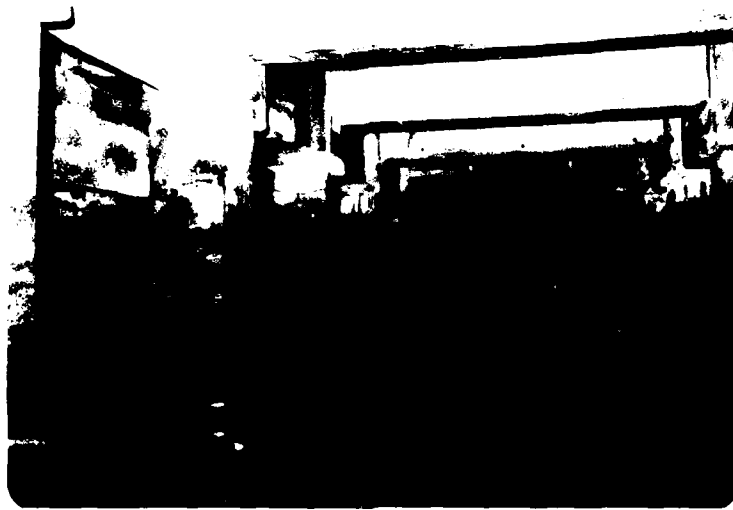
PHOTOGRAPH NO. 9

North Apron of Pier 11A. Note two story warehouse and timber fender system around perimeter of structure.



PHOTOGRAPH NO.10

Concrete retaining wall or bulkhead at Bent 70N. Note that the concrete caps which span the 20" concrete piles are continuous with the bulkhead.



PHOTOGRAPH NO.11

Typical concrete cap and stringer framing. Note concrete bulkhead in background.

Pile lengths along the berth faces were found to be approximately 30 - 35 feet, mudline to cap. Detailed measurements of pile length were taken at intervals throughout the structure and are shown on Drawings 1 and 2. At several locations around the concrete bulkhead, the individual piles were not visible to inspection because of build up of the rip-rap toe (See Drawing 3).

For a detailed description of the structure and the identification of the examined members, see the accompanying drawings 1 - 3. These drawings are based on NAVFAC reference drawings: 1203509 - Sheets 1 - 22.

4.3 OBSERVED INSPECTED CONDITION

The detailed inspection results for the Level II inspection(s) of the concrete sheet wall bulkhead and the concrete bearing piles are presented in Tables 1 and 2. The location identification and the condition of the examined piles and sheet wall sites are presented graphically in the preceding Drawings 1 and 2.

The condition of the concrete seawall or bulkhead which extends around the perimeter of the warehouse is very good. As shown in Photograph Nos. 4, 11 and 12, no evidence of deterioration of any of the component elements of the sheet pile wall, the cap or the concrete wall above the rip-rap was found. Rip-rap covers most of the sheet piles, however, at some locations (sites) 3 - 4 feet of the piles were exposed to inspection. The outer edge of the concrete cap has sustained minor deterioration at some locations, most likely due to rip-rap placement. No evidence of rebar exposure or corrosion was found. The interlock region of all exposed piles is in good condition. No failure, yielding, concrete deterioration, or other damage was found.

The overall condition of the bearing and batter piles is generally very good. One section of the structure, at the north east apron, however, was found to have several deteriorated piles.

The Level I and II inspections of the entire south apron section and the north apron section from the west pier face eastward to Bent 42 showed these piles to be in excellent condition. Photograph Nos. 14 and 15 serve to illustrate the condition of these piles. Note that no evidence of cracking, spalling or exposure and corrosion of the underlying rebar was found. A total of three piles, bent 69N - piles 1 and 2 and bent 78 - pile 25 were noted to be broken off, likely due to ship or barge impact. As shown in Photograph No. 16, these defective piles have been replaced with new concrete piles and no further maintenance is warranted.

The condition of the piles in the north east apron section of the structure, i.e. from the shore to bent 41, is fair. The Level I inspection of the

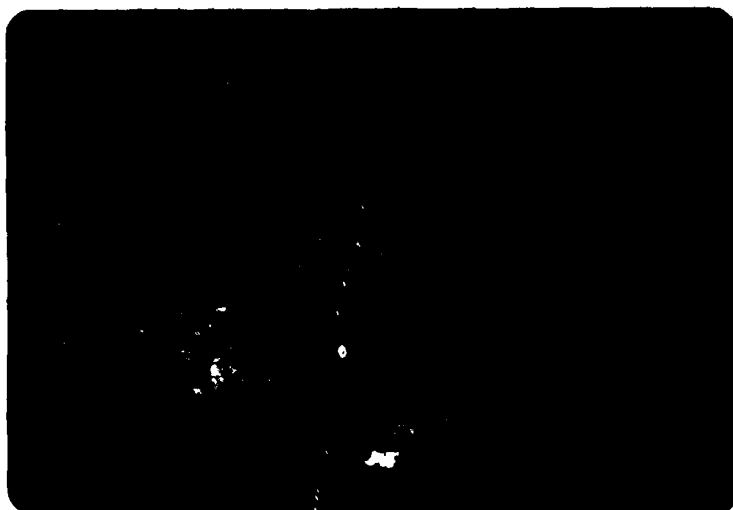


PHOTOGRAPH NO.12

Level II cleaning of Site 5: Note good condition of cap and interlock region of pile.

PHOTOGRAPH NO.13

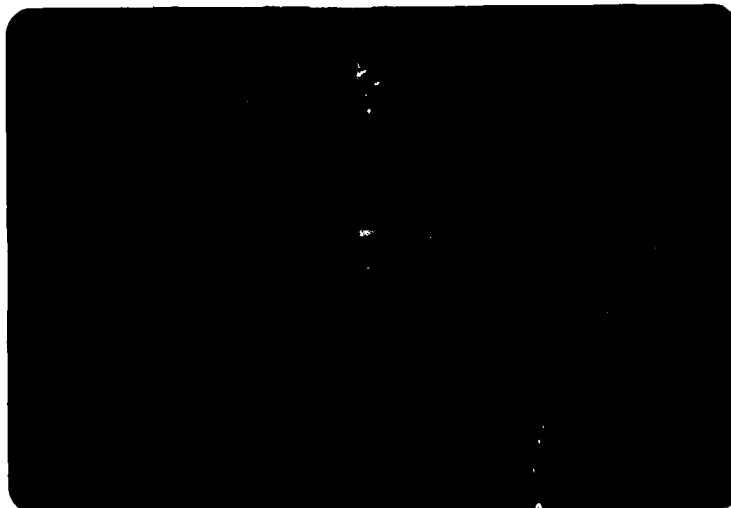
Level II cleaning of Site 4. Note good condition of interlock and rip-rap at mudline.





PHOTOGRAPH NO.14

Pile 33S-2. Level II cleaning to expose concrete surface. Note good condition of concrete.



PHOTOGRAPH NO.15

Pile 33S-6-1 (Cluster). Note good condition of cleaned pile, also note toe of rip-rap which extends to the concrete pile bulkhead.



PHOTOGRAPH NO.16

Bent 69N. Note piles 1 and 2 have been broken off and replaced by three new concrete piles and cap framing.

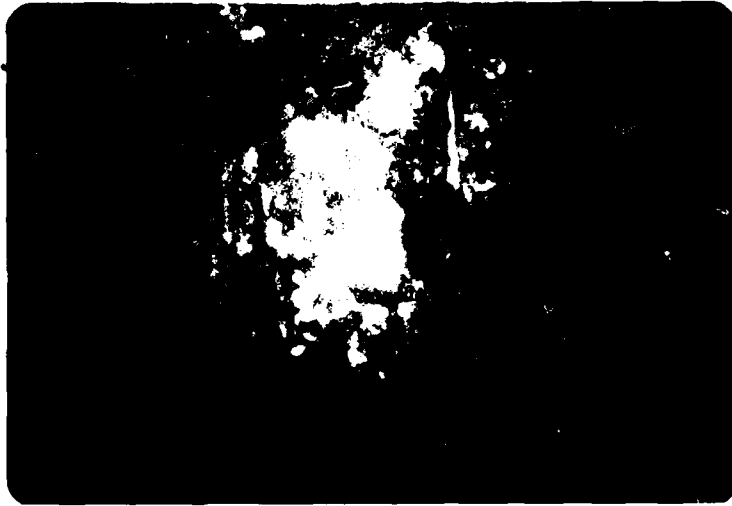


PHOTOGRAPH NO.17

Pile 23N-1. Level II cleaning to expose cracking and spalling of corner of pile. Note rust bleeding from corroding rebar.

piles in this area showed evidence of cracking and spalling on some piles. (see Drawing No. 1). When detailed Level II cleaning and inspection was carried out, 18 of the examined 51 piles were found to have sustained significant damage. As shown in Photograph Nos. 17 - 19, this damage consisted of cracking and/or spalling of the corner(s) of the piles. In some instances, this deterioration has resulted in the exposure and subsequent corrosion of the rebar. This damage was found to range from the lower intertidal zone to the mudline.

Although not included in the scope of the current contract, a cursory inspection of the fender system, which extends around the perimeter of the structure was carried out. As shown in Photograph Nos. 20 and 21, the condition of the fender system is poor. Extensive mechanical and fungal damage was noted in the intertidal zone and above, and heavy marine borer damage was noted in the lower intertidal and submerged zones.



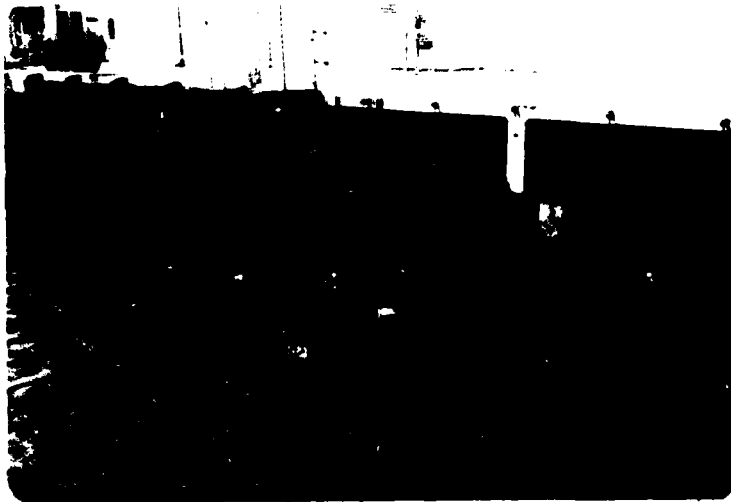
PHOTOGRAPH NO.18

Pile 33N-5. Deteriorated concrete has been removed to expose the corroding rebar at the corner of the pile.



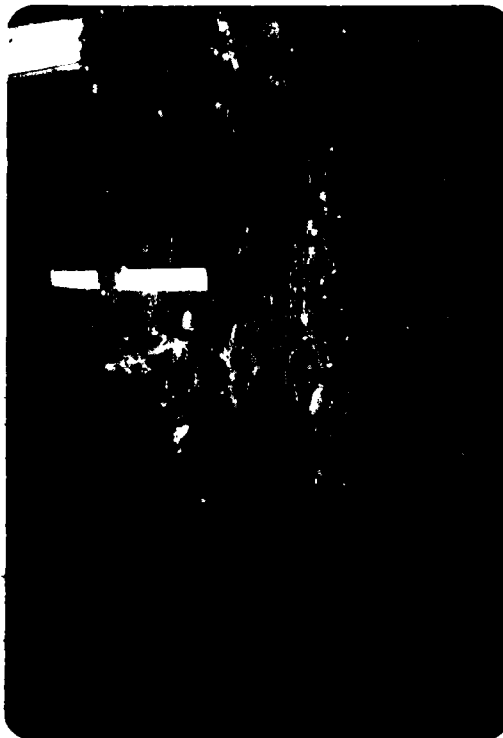
PHOTOGRAPH NO.19

Pile 13N-1. 4 Foot length of rebar exposed at corner of pile.



PHOTOGRAPH NO.20

South face fender system. Note broken pile at center of photo and missing piles and timbers in foreground.



PHOTOGRAPH NO.21

Typical heavy marine borer damage to fender piles. Note floating camel log in background.

4.4 STRUCTURAL CONDITION ASSESSMENT

The overall condition of Pier 11A is good. No major structural deterioration was observed which would result in the downgrading of the structure.

The concrete sheet pile wall or bulkhead was found to be in very good condition. Only minor deterioration of some pile caps was observed. As this damage is of a cosmetic nature and of no structural significance, maintenance is not warranted.

The integrity of the 20" X 20" concrete bearing and batter piles were found to be in very good condition. One section of the structure however, was found to have concentrated damage and will require maintenance. The damaged section is located at the shoreward end of the north apron, from the shore to bent 41. A total of 18 of the examined 51 Level II cleaned piles in this section have sustained significant damage. Typically, this damage includes cracking and/or spalling of the concrete and corrosion of the rebar.

The damage on the individual piles was found to range from the mean low water (MLW) elevation to the mudline.

4.5 RECOMMENDATIONS

It is recommended that the following defective piles in the North Apron Section be repaired:

<u>BENT NO.</u>	<u>PILE NO.</u>
6	1
	9
13N	1
	1 - Batter
	2
	4
23N	1
	1 - Batter
	2
	3
	4
33N	1
	1 - Batter
	2
	3
	4
	5
	6
TOTAL	<hr/> 18 Piles <hr/>

For details of the damage to these piles, see Table 2.

Effective maintenance/repair of these piles could be achieved by the installation of a concrete jacket or encasement. The estimated cost for repairing these piles is approximately \$24,000.00. (see appendices for the cost estimate for repairs). The level of damage found represents approximately 35% of the 51 examined piles. Projected over the approximately 500

similar piles in the North Apron section of the structure, it is estimated that approximately 175 piles will have sustained significant damage and may require maintenance. The estimated cost of these repairs is approximately \$225,000.00. (see Table 3). Prior to any maintenance being carried out, it is recommended that the North Apron section be subjected to further detailed Level II inspection to confirm the condition of all piles and to specifically identify additional piles that may require maintenance.

In addition to the above, a detailed inspection of the fender system should be carried out. As the fenders serve to protect the structural piles, this system should be maintained and kept in good repair.

Once the required maintenance has been carried out, the repairs should be re-inspected. This maintenance and re-inspection will serve to ensure the structural integrity of the facility.

In addition to the above re-inspection, it is also recommended that periodic inspections at three to five year intervals be carried out. These subsequent inspections will serve to identify any areas requiring maintenance and will thereby ensure the future structural integrity of the facility. All subsequent inspections should use this report as a datum or baseline.

LEGEND TO TABLES

BR	=	Batter pile
Cr	=	Crack
Cor	=	Corrosion
D	=	Damaged
DES	=	Destroyed
E	=	East
Exp.	=	Exposed
ITZ	=	Intertidal Zone
ML	=	Mudline
MLW	=	Mean Low Water
N	=	North
NB	=	Not Bearing
RB	=	Rebar
S	=	South
SP	=	Spalling
UD	=	Undamaged
W	=	West
$\frac{1}{2}$ ML	=	Submerged zone $\frac{1}{2}$ way ITZ to mudline

Example: Typical damage notation for concrete piles

37 - A SP -10 to -15 12" x 6" RB Exp.
 ↑ ↑ ↑
 Bent Pile Damage Elevation of Width Depth Rebar Exposed
 Type
 respect to the
 cap "0" point

TABLE 1
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE BULKHEAD

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Site 1 - Bent 12 at Row 19 East	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 2 - Bent 12S	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 3 - Bent 29S	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 4 - Bent 43S	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 5 - Bent 58-59S	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 6 - Bent 70 Row 14 - 15	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 7 - Bent 59N	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Site 8 - Bent 43N	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 1
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE BULKHEAD

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Site 9 - Bent 29N	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
site 10 - Bent 12N	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 6 (34 consecutive piles north — South)		
Pile 1	MLW	Cracking at corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 6 - Pile 9	MLW	Cracking at corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 10	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 11	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 12	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 13	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 14	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 15	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 16	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 6 - Pile 17	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 18	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 19	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 20	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 21	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 22	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 23	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 24	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 6 - Pile 25	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 26	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 27	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 28	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 29	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 30	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 31	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 32	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 6 - Pile 33	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 34	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
<u>NORTH FACE</u>		
BENT 13N - Pile 1	MLW	Heavy Cr and SP MLW to ML on 3 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	SP -24' to -28' 12" x 5" RB Exp.
Pile 1-Br	MLW	Cr MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Cr MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Cr MLW to ML on 1 corner.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 13N - Pile 6	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9-Br	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 23N - Pile 1	MLW	Cr MLW to ML on 1 corner
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 1-Br	MLW	Cr MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	SP -20' to -21' 6" x 3"
	ML	Undamaged
Pile 2	MLW	Cr MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	SP -28' to -30" 8" x 4". Rust bleeding.

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 23N - Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Cr $\frac{1}{2}$ ML to ML on corners.
	ML	Undamaged
Pile 4	MLW	Minor cracking.
	$\frac{1}{2}$ ML	SP -11' to -12' 3" x 2".
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9-Br	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 33N - Pile 1	MLW	Cr and SP MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	SP -19' to -20' 10" x 5". RB Exp.
	ML	SP -28' to -30' 11" x 5". RB Exp. on 2 crnrs
Pile 1-Br	MLW	SP MLW to ML 8" x 3". Cr MLW to ML on 2 crnrs
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Cr and SP MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	SP -26' to -27' 9" x 4". RB Exp.
Pile 3	MLW	Cr MLW to ML
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	SP MLW to ML 4" x 3" on 2 corners. Cr MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Cr and SP MLW to ML on 2 corners.
	$\frac{1}{2}$ ML	Undamaged
	ML	SP -16' to -18' 9" x 4".
Pile 6	MLW	Minor cracking.
	$\frac{1}{2}$ ML	Undamaged
	ML	SP -14' to -15' 12" x 6". RB Exp.
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 33N - Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 9	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9-Br	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 34N - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 2	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 43N - Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 53N - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 53N - Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 53N - Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 63N - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 63N - Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 6-4	MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
Pile 7		Undamaged
		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Pile 8		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Bent 72 - Pile 1		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Pile 2		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Pile 3		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Pile 4		MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 72 - Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 20	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 21	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 22	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 23	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 72 - Pile 24	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 25	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 26	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 27	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 28	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 73 - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 2	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 73 - Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 9	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 10	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 11	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
<u>SOUTH FACE APRON</u>		
Bent 13S - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 13S - Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 7	MLW
		Undamaged
		$\frac{1}{2}$ ML
		Undamaged
		ML
		Undamaged
Bent 23S - Pile 1		
Bent 23S - Pile 2		
Bent 23S - Pile 3		
Bent 23S - Pile 4		
Bent 23S - Pile 5		

TABLE 2
PIER 11A - N.S.C. - SAN DIEGO
LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 23S - Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 33S - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 33S - Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL 11 INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 33S - Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 43S - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Rent 43S - Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 6-4	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 8	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
3ent 53S - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 2	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
	Pile 4	
	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 53S - Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Bent 63S - Pile 1	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 63S- Pile 2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 5	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-1 (Cluster)	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-2	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-3	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 6-4	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 2
 PIER 11A - N.S.C. - SAN DIEGO
 LEVEL II INSPECTION RESULTS OF CONCRETE PILES

SITE ID	ELEVATION	DESCRIPTION OF DAMAGE
Bent 63S - Pile 7	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged
Pile 8	MLW	Undamaged
	$\frac{1}{2}$ ML	Undamaged
	ML	Undamaged

TABLE 3
COST ESTIMATE FOR REQUIRED MAINTENANCE

STRUCTURE	DAMAGE/DEFECTS FOUND	RECOMMENDED REPAIRS	UNIT COST OF REPAIR	TOTAL COST OF REPAIRS FOR CURRENT INSPECTION (SAMPLING)	TOTAL ESTIMATED NUMBER OF DAMAGED MEMBERS **	ESTIMATED TOTAL COST OF REPAIRS FOR PROJECTED DAMAGE
19 PIER 11A N.S.C. San Diego	18 concrete piles (35% of piles sampled in North Apron section, Bents 1 - 41)	Installation of concrete jackets	\$1,300.00*	\$24,000.00	35% of the approximately 500 similar piles in the North Apron section (Bents 1 - 41) = 175 piles	\$225,000.00

* Based on an average jacket length of 15 - 20 feet.

** Based on projecting the percentage of damage found over the total number of piles in the structure.

END

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